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PUBLIC HEALTH

PAPERS AND REPORTS

VOLUME XXI

PRESENTED AT THE TWENTY-THIRD ANNUAL MEETING OF THE

American Public Health Association

DENVER, COLORADO, OCTOBER 1–4

1895

AND AN ABSTRACT OF THE RECORDS AND PROCEEDINGS TOGETHER WITH A FEW PAPERS READ AT THE BUFFALO MEETING, 1896

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By Dr. Irving A. Watson, Secretary American Public Health Association

Concord, N. H.

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CONSTITUTION

OF THE

AMERICAN PUBLIC HEALTH ASSOCIATION.

TITLE.

I. This Association shall be called "THE AMERICAN PUBLIC HEALTH ASSOCIATION."

OBJECTS.

II. The objects of this Association shall be the advancement of sanitary science, and the promotion of organizations and the measures for the practical application of public hygiene.

MEMBERS.

III. The members of this Association shall be known as Active and Associate. The Executive Committee shall determine for which class a candidate shall be proposed. The *Active* members shall constitute the permanent body of the Association, subject to the provisions of the constitution as to continuance in membership. They shall be selected with special reference to their acknowledged interest in or devotion to sanitary studies and allied science, and to the practical application of the same. The *Associate* members shall be elected with special reference to their general interest only in sanitary science, and shall have all the privileges and publications of the Association, but shall not be entitled to vote.

Delegates from national, state, provincial, and municipal boards of health, organized sanitary associations, and the army, navy, and marine hospital service, shall be entitled to be enrolled as active members upon presentation of their credentials to the Executive Committee. Members, not delegates from such bodies, shall be elected as follows:

Each candidate for admission shall first be proposed to the Executive Committee, in writing (which may be done at any time), with a statement of the business or profession and special qualifications of the person so proposed. On recommendation of a majority of the committee, and on receiving a vote of two thirds of the members present at the regular meeting, the candidate shall be declared duly elected a member of the Association. The annual fee of membership in either class shall be five dollars.

OFFICERS.

IV. The officers shall be a President, a First, and a Second Vice-President, a Secretary, and a Treasurer.

All the officers shall be elected by ballot, annually, except the Secretary, who shall be elected for a term of three years.

PRESIDING OFFICER.

V. The President, or in his absence one of the Vice-Presidents, or in their absence a chairman *pro tempore*, shall preside at all meetings of the Association. He shall preserve order, and shall decide all questions of order, subject to appeal to the Association. He shall also appoint all committees authorized by the Association, unless otherwise specially ordered.

SECRETARY.

VI. The Secretary shall have charge of the correspondence and records of the Association; and he shall also perform the duties of Librarian. He, together with the presiding officer, shall certify all acts of the Association. He shall, under the direction of the Executive Committee, give due notice of the time and place of all meetings of the Association, and attend the same. He shall keep fair and accurate records of all the proceedings and orders of the Association; and shall give notice to the several officers, and to the Executive and other committees of all votes, orders, resolves, and proceedings of the Association, affecting them or appertaining to their respective duties.

TREASURER.

VII. The Treasurer shall collect and take charge of the funds and securities of the Association. Out of these funds he shall pay such sums only as may be ordered by the Association, or by the Executive Committee. He shall keep a true account of his receipts and payments, and at each annual meeting render the same to the Association, when a committee shall be appointed to audit his accounts. If, from the annual report of the Treasurer, there shall appear to be a balance against the treasury, no appropriation of money shall be made for any object but the necessary current expenses of the Association until such balance shall be paid.

STANDING COMMITTEES.

VIII. There shall be the following standing committees: (1) The Executive Committee, (2) the Advisory Council, (3) the Committee on Publication.

EXECUTIVE COMMITTEE.

IX. The Executive Committee shall consist (1) of the President, First Vice-President, Second Vice-President, Secretary, and Treasurer; (2) of six active members, of whom three shall be elected annually by ballot, to serve two years, and who shall be ineligible to reëlection for a second successive term; and (3) of the ex-Presidents of the Association.

It shall be the duty of the Executive Committee to consider and recommend plans for promoting the objects of the Association, to authorize the disbursement and expenditure of unappropriated moneys in the treasury for the payment of current expenses; to consider all applications for membership, and, at the regular meetings, report the names of such candidates as a majority shall approve; and, generally, to superintend the interests of the Association and execute all such duties as may, from time to time, be committed to them by the Association. At least one month preceding the annual meeting of the Association, the Executive Committee shall cause to be issued to members a notice of such meeting, and they are authorized to publish the same in medical, scientific, and other periodicals, but without expense to the Association; and such notice shall contain the order of business to be followed at said meeting, and, briefly, the subjects to be presented and the special points of discussion.

ADVISORY COUNCIL.

X. The Advisory Council shall consist of one member from each state, territory, and district, the army, navy, and marine hospital service, the Dominion of Canada, and each of the Provinces, who shall be appointed by the President on the last day of each session, and who, besides acting as nominating committee of officers for the ensuing year, to be announced at such time as the Executive Committee may appoint, shall consider such questions and make such recommendations to the Association as shall best secure the objects of the Association. They shall at their first meeting elect from their own number a Secretary, whose record of their proceedings shall be made part of the records of the Association.

COMMITTEE ON PUBLICATION.

XI. The Committee on Publication shall consist of the Secretary an two active members, selected by the Executive Committee, who shall contract for, arrange, and publish, under authority of the Executive Committee, the proceedings of the Association, including such papers as have been examined and approved by the Executive Committee, or which have been submitted to them by the latter for their discretionary action.

REPORTS AND PAPERS.

XII. All committees, and all members preparing scientific reports of papers to be laid before the Association at its annual meetings, must give, in writing, the title of such reports or papers, the time to be occupied in reading them, and an abstract of their contents, to the Executive Committee, at least one week preceding the date of such meeting, to secure their announcement in the order of business.

MEETINGS.

XIII. The time and place of each annual meeting shall be fixed at the preceding annual meeting, but may be changed by the Executive Committee for reasons that shall be specified in the announcement of the meeting. Special meetings may be called, at any time or place, by concurrence of two thirds of the Executive Committee. There shall be no election of officers, or change of By-Laws, or appropriation of money to exceed the amount at that time in the treasury, at such special meeting, except by a vote of a majority of all the members of the Association. Whenever a special meeting is to be held, at least one month's notice shall, if possible, be given by circular to all the members, together with the order of business.

QUORUM.

XIV. At the annual meeting nine members shall constitute a quorum for the election of officers, a change of the constitution, the election of members, and the appropriation of moneys.

ORDER OF BUSINESS.

XV. The order of business at all meetings of the Association shall be fixed by the Executive Committee, and such order must be completed before any other business is introduced, except such order of business is suspended by a vote of four fifths present.

ALTERATION OF CONSTITUTION.

XVI. No alteration in the Constitution of the Association shall be made except at an annual meeting, or unless such alteration shall have been proposed at a previous meeting, and entered on the minutes with the name of the member proposing the same, and shall be adopted by a vote of two thirds of the members present.

BY-LAWS OF THE EXECUTIVE COMMITTEE.

QUORUM.

1. Seven members shall constitute a quorum for the transaction of such business as may come before the committee.

MEMBERS RESTRICTED.

2. No elective member of the Executive Committee shall be at the same time a member of the Advisory Council, if there is another member of the Association from his state or service.

PARLIAMENTARY USAGE.

3. Cushing's Law and Practice of Legislative Assemblies shall be the guide of parliamentary practice until otherwise ordered.

PAPERS.

4. All papers presented to the Association must be either printed, typewritten, or in plain handwriting, and in order to secure a place in the programme *must* positively be in the possession of the secretary by 9 a. m. of Monday preceding the meeting, in order that they may be submitted to the Executive Committee and placed in the hands of the subcommittee charged with the preparation of the daily programme of the session.

5. If any paper is too late for critical examination, said paper may be so far passed upon by the Executive Committee as to allow its reading, but such paper shall be subject to publication or non-publication, as the Executive Committee deem expedient.

6. All papers accepted by the Association, whether read in full, by abstract, by title, or filed, shall be delivered to the Secretary as soon as thus disposed of, as the exclusive property of the Association. Any paper presented to this Association and accepted by it shall be refused publication in the transactions of the Association, if it be published, in whole or in part, by permission or assent of its author, in any manner prior to the publication of the volume of transactions, unless written consent is obtained from the Publication Committee.

7. All papers on subjects within the province of special committees shall be referred to the chairmen of the several committees, who shall

report the same to the Association incorporated with their annual reports, or refer them to the Executive Committee for consideration.

8. No paper shall hereafter be considered, of which a condensed abstract shall not have been placed in the hands of the secretary at least twenty days before the date of the annual meeting.

9. Chairmen of committees, in making reports, shall be absolutely limited to thirty minutes, reading of papers to twenty minutes, and participants in discussion to five minutes.

10. Papers presented to the Association shall be confined to strictly sanitary, climatologic, and preventive questions, all clinical, pathological, therapeutic, or other strictly medical statements being excluded; nor shall any paper tending to the advertisement of special or local interests or establishments be accepted.

11. The Secretary shall have no discretion in the matter of the enforcement of the regulations of the Executive Committee as to the acceptance of papers.

PUBLICATION COMMITTEE.

12. The Committee on Publication, charged with the duties of selecting and printing the papers and transactions of the Association, shall consist of three active members of the Association, and of whom one shall be the Secretary, appointed by the Executive Committee during the session of the Association, and selected with reference to their facilities of meeting.

13. All papers read by title, and others not definitely passed upon by the Executive Committee, shall be referred to the Publication Committee for critical examination; and said committee is authorized to reject such papers as in its judgment are not worthy of publication, and to omit such others as cannot be included within the limits of the annual volume.

14. The Publication Committee shall procure a copyright on the transactions in the name of the Association, and the committee shall have full charge of the publication of the transactions.

APPLICATION FOR MEMBERSHIP.

15. All applications for membership must be made upon the application blank of the Association. The Secretary is authorized, upon receiving an application for membership in the interval between the annual meetings, accompanied by the fee of five dollars, to furnish the applicant with the current volume of the transactions, and is directed to place the name of the applicant so supplied, when properly endorsed, upon the list of candidates to be acted upon at the next annual meeting. The Secretary shall notify each applicant of the action taken, and shall transfer without delay all money thus received to the Treasurer.

16. Persons not members, having prepared papers to be presented at the meetings of the Association, shall be proposed for membership at the first business meeting of the Association.

EXPENDITURES.

17. All bills connected with the publication of the transactions shall, upon the approval of the chairman of the Publication Committee and the Secretary, be signed by the President of the Association, and paid by check of the Treasurer directly to the party concerned; and the President shall not approve any bill, relating either to publishing or printing, without the approval first of the chairman of the committee in charge thereof.

18. Bills for current expenses shall be first approved by the Secretary, then sent to the President, and on his approval they shall be paid by check of the Treasurer directly to the parties interested.

19. The actual and necessary travelling expenses of the Secretary and Treasurer to the annual meeting of the Association, and to one meeting of the Executive Committee, shall be classed as current expenses.

RESOLUTIONS.

20. All resolutions presented to the Association shall be sent to the Chair in writing, and referred to a committee without discussion.

ARREARAGES.

21. The arrearages of all members remitting their dues for two years shall be cancelled up to the date of the last payment, but they shall be entitled to the transactions of the Association only for the years for which they have actually paid.

AUDITING COMMITTEE.

22. An Auditing Committee shall be appointed by the Chair to audit the accounts of the Treasurer, and report upon the same.

OFFICERS AND COMMITTEES

OF THE

AMERICAN PUBLIC HEALTH ASSOCIATION.

Officers, 1895–1896.

President, ...	Dr. Eduardo Licéaga, *Mexico, Mex.*
First Vice-President, .	Lieut. Col. Alfred A. Woodhull, Medical Dept., U. S. Army, *Denver, Col.*
Second Vice-President,	Dr. Henry Sewall, *Denver, Col.*
Secretary, ...	Dr. Irving A. Watson, *Concord, N. H.*
Treasurer, ...	Dr. Henry D. Holton, *Brattleboro', Vermont.*

Ex-Presidents of the Association.

Prof. Stephen Smith	*New York City.*
Deputy Surgeon-General John S. Billings	*U. S. Army.*
Prof. Robert C. Kedzie	*Lansing, Mich.*
Medical-Director Albert L. Gihon	*U. S. Navy.*
Dr. Henry P. Walcott	*Cambridge, Mass.*
Surgeon-General George M. Sternberg	*U. S. Army.*
Dr. Charles N. Hewitt	*Red Wing, Minn.*
Dr. Henry B. Baker	*Lansing, Mich.*
Dr. Frederick Montizambert	*Quebec, Canada.*
Dr. Felix Formento	*New Orleans, La.*
Dr. Samuel H. Durgin	*Boston, Mass.*
Dr. E. P. Lachapelle	*Montreal, P. Q.*
Dr. William Bailey	*Louisville, Ky.*

(The ex-Presidents, *ex-officio* members Executive Committee.)

STANDING COMMITTEES.

Executive Committee.

(Elective.)

Dr. Henry I. Bahnson	*Salem, N. C.*
Dr. Peter H. Bryce	*Toronto, Ont.*
Dr. E. P. DeVaux	*Valley City, N. D.*
Dr. J. C. Shrader	*Iowa City, Iowa.*

Dr. R. S. Goodwin . . . . . *Thomaston, Conn.*
Dr. James F. McShane . . . . . *Baltimore, Md.*

ADVISORY COUNCIL.

United States:

Alabama	Dr. Jerome Cochran, *Mobile.*
Arkansas	Dr. H. C. Dunnavant, *Osceola.*
California	Dr. J. R. Laine, *Sacramento.*
Colorado	Dr. Wm. P. Munn, *Denver.*
Connecticut	Dr. F. W. Wright, *New Haven.*
Delaware	Mr. W. C. R. Colquhoun, *Wilmington.*
Florida	Dr. Joseph Y. Porter, *Key West.*
Georgia	Dr. William F. Brunner, *Savannah.*
Illinois	Dr. L. H. Montgomery, *Chicago.*
Indiana	Dr. Lindsay S. Whitesides, *Franklin.*
Iowa	Dr. A. W. Cantwell, *Davenport.*
Kansas	Dr. Thomas Kirkpatrick, *Topeka.*
Kentucky	Dr. J. N. McCormack, *Bowling Green.*
Louisiana	Dr. Felix Formento, *New Orleans.*
Maine	Dr. A. G. Young, *Augusta.*
Maryland	Dr. James F. McShane, *Baltimore.*
Massachusetts	Dr. S. H. Durgin, *Boston.*
Michigan	Dr. Cressy L. Wilbur, *Lansing.*
Minnesota	Dr. Henry M. Bracken, *Minneapolis.*
Mississippi	Dr. Wirt Johnston, *Jackson.*
Missouri	Dr. J. D. Griffith, *Kansas City.*
Nebraska	Dr. Frederick D. Haldeman, *Ord.*
New Hampshire	Dr. G. P. Conn, *Concord.*
New Jersey	Dr. Henry Mitchell, *Asbury Park.*
New Mexico	Dr. Samuel D. Swope, *Deming.*
New York	Dr. A. Walter Suiter, *Herkimer.*
North Carolina	Dr. Richard H. Lewis, *Raleigh.*
North Dakota	Dr. John Montgomery, *Ardoch.*
Ohio	Dr. C. O. Probst, *Columbus.*
Oklahoma Ter	Dr. Charles F. Waldron, *Oklahoma City.*
Pennsylvania	Mr. Crosby Gray, *Pittsburgh.*
Rhode Island	Dr. Gardner T. Swarts, *Providence.*
South Carolina	Dr. H. B. Horlbeck, *Charleston.*
South Dakota	Dr. K. M. O. Teigen, *Fargo.*
Tennessee	Dr. J. Berrien Lindsley, *Nashville.*
Texas	Dr. R. M. Swearingen, *Austin.*
Vermont	Dr. Charles S. Caverly, *Rutland.*
Virginia	Prof. John B. Minor, *University of Virginia.*
Washington	Dr. G. S. Armstrong, *Olympia.*
West Virginia	Dr. Louis D. Wilson, *Wheeling.*
Wisconsin	Dr. U. O. B. Wingate, *Milwaukee.*
Dist. of Columbia	Dr. Ralph Walsh, *Washington.*
U. S. Army	Surgeon H. S. Terrill, *Ft. Riley, Kans.*
U. S. M. H. Service	Surgeon P.H.Bailhache, *Stapleton, Staten Island, N. Y.*
U. S. Navy	Medical Director Newton L. Bates, *Washington, D. C.*

Canada:

Dominion of Canada	Dr. Frederick Montizambert, *Quebec.*
Province of Ontario	Dr. Peter H. Bryce, *Toronto.*
Province of Quebec	Dr. E. P. Lachapelle, *Montreal.*

Manitoba	Dr. JAMES PATTERSON, *Winnipeg.*
New Brunswick	Dr. GEORGE E. COULTHARD, *Fredericton.*
Nova Scotia	Dr. A. P. REID, *Halifax.*

MEXICO:

Aguascalientes	Dr. AGUSTIN CHACON, *México, D. F.*
Campeche	Dr. PATRICIO FRUEBA, *Campeche.*
Colima	Dr. JOSÉ LUNA, *Colima.*
Coahuila	Dr. DIONISIO GARCIA FUENTES, *Saltillo.*
Chihuahua	Dr. MIGUEL MARQUES, *Chihuahua.*
Chiapas	Dr.BERNARDO MARTINEZ BACA, *San Cristobal las Casas.*
Durango	Dr. FERNANDO ZARRAGA, *México, D. F.*
Guanajuato	Dr. JESUS CHICO, *Guanajuato.*
Guerrero	Dr. LEOPOLDO VIRAMONTES, *Chilpancingo.*
Hidalgo	Dr. ALBERTO ESPINOSA, *Pachuca.*
Jalisco	Dr. SALVADOR GARCIADIEGO, *Guadalajara.*
Michoacán	Dr. FRANCISCO ITURBIDE, *Morelia.*
Morelos	Dr. ANGEL GAVIÑO, *México, D. F.*
México	Dr. JUAN N. CAMPOS, *Toluca.*
Nuevo León	Dr. AMADO FERNANDEZ, *Monterey.*
Oaxaca	Dr. TOMAS NORIEGA, *México, D. F.*
Puebla	Dr. GUSTAVO O'FARRILL, *Puebla.*
Querétaro	Dr. MANUEL SEPTIEN, *Querétaro.*
San Luis Potosí	Dr. JESUS E. MONJARAS, *San Luis Potosí.*
Sonora	Dr. PRISCILIANO FIGUEROA, *Guaymas.*
Sinaloa	Dr. LEOPOLDO ORTEGA, *Mazatlan.*
Tabasco	Dr. ALFONSO RUIZ ERDOZAIN, *México, D. F.*
Tamaulipas	Dr. T. MARTINEZ CALLEJA, *Ciudad Victoria.*
Tlaxcala	Dr. FRANCISCO BERNALDEZ, *México, D. F.*
Veracruz	Dr. GREGORIO MENDIZABAL, *México, D. F.*
Yucatan	Dr. RAMON ALBERT PACHECO, *Mérida.*
Zacatecas	Dr. TOMAS LORCK, *Zacatecas.*
Territorio de la BajaCalif[a]	Dr. TOBÍAS NUÑEZ, *México, D. F.*
Territorio de Tepic	Dr. CARLOS FENELON, *Tepic.*
Distrito Federal	Dr. DOMINGO ORVAÑANOS, *México, D. F.*

PUBLICATION COMMITTEE.

Dr. IRVING A. WATSON	Concord, N. H.
Dr. GRANVILLE P. CONN	Concord, N. H.
Dr. SAMUEL W. ABBOTT	Wakefield, Mass.

SPECIAL COMMITTEES.

ON THE POLLUTION OF WATER-SUPPLIES.

Major CHARLES SMART, U. S. A. . . . . Washington, D. C.
(With authority to select associates).

ON THE DISPOSAL OF GARBAGE AND REFUSE.

RUDOLPH HERING, C. E.	277 Pearl St., New York City.
Prof. DELOS FALL	Albion, Mich.
Dr. LOUIS LABERGE	Montreal, P. Q.
Dr. HENRY F. HOYT	St. Paul, Minn.
ROBERTO GAYOL, C. E.	Mexico, Mex.

ON ANIMAL DISEASES AND ANIMAL FOOD.

D. E. Salmon, D. V. M. . . . . Washington, D. C.
Prof. James Law . . . . . Ithaca, N. Y.
Prof. José L. Gomez. . . . . Mexico, Mex.
Dr. Henry N. Avery . . . . . Minneapolis, Minn.
Dr. Carl Weidner . . . . . Louisville, Ky.

ON NOMENCLATURE OF DISEASES AND FORMS OF STATISTICS.

Dr. Samuel W. Abbott . . . . . Wakefield, Mass.
Dr. Jesus E. Monjaras . . . . . San Luis Potosi, Mex.
Dr. Elzéar Pelletier . . . . . Montreal, P. Q.
Dr. Cressy L. Wilbur . . . . . Lansing, Mich.
Dr. Charles N. Hewitt . . . . . Red Wing, Minn.

ON PROTECTIVE INOCULATIONS IN INFECTIOUS DISEASES.

Dr. C. N. Hewitt . . . . . Red Wing, Minn.
Surgeon-General George M. Sternberg, U. S. A. . . . Washington, D. C.
Dr. George H. F. Nuttall . . . . . Baltimore, Md.
Dr. M. Carmona y Valle . . . . . Mexico, Mex.
Dr. Wm. C. Bailey . . . . . Knoxville, Tenn.

ON NATIONAL HEALTH LEGISLATION.

Dr. Henry P. Walcott . . . . . Cambridge, Mass.
Dr. J. N. McCormack . . . . . Bowling Green, Ky.
Dr. Irving A. Watson . . . . . Concord, N. H.
Dr. James D. Plunket . . . . . Nashville, Tenn.
Dr. Henry B. Baker . . . . . Lansing, Mich.
Dr. Samuel R. Oliphant . . . . . New Orleans, La.
Dr. Richard M. Swearingen . . . . . Austin, Tex.
Dr. Henry B. Horlbeck . . . . . Charleston, S. C.
Dr. Benjamin Lee . . . . . Philadelphia, Pa.
Dr. Samuel H. Durgin . . . . . Boston, Mass.
Dr. U. O. B. Wingate . . . . . Milwaukee, Wis.
Dr. Stephen Smith . . . . . New York.
Dr. C. O. Probst . . . . . Columbus, O.

ON THE CAUSE AND PREVENTION OF DIPHTHERIA.

Dr. J. J. Kinyoun, U. S. M. H. S. . . . . Washington, D. C.
Dr. Peter H. Bryce . . . . . Toronto, Ont.
Dr. Juan Ramirez de Arellano . . . . . Mexico, Mex.
Dr. Wyatt Johnston . . . . . Montreal, P. Q.
Dr. A. W. Suiter . . . . . Herkimer, N. Y.

ON CAUSES AND PREVENTION OF INFANT MORTALITY.

Dr. Charles N. Hewitt . . . . . Red Wing, Minn.
(With authority to select associates.)

ON CAR SANITATION.

Dr. Granville P. Conn . . . . . Concord, N. H.
E. C. Jordon, C. E. . . . . Portland, Me.
Dr. Domingo Orvañanos . . . . . Mexico, Mex.
Prof. S. H. Woodbridge . . . . . Boston, Mass.
Dr. E. R. Lewis . . . . . Kansas City, Mo.

INTERNATIONAL COMMITTEE ON THE PREVENTION OF THE SPREAD OF YELLOW FEVER.

Dr. Felix Formento . . . . . New Orleans, La.
Surgeon-General George M. Sternberg, U. S. A. . . . Washington, D. C.
Dr. Gregorio Mendizabal . . . . . Orizaba, Vera Cruz, Mex.
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ON THE TRANSPORTATION AND DISPOSAL OF THE DEAD.

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Dr. Elzéar Pelletier . . . . . Montreal, P. Q.
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ON THE USE OF ALCOHOLIC DRINKS FROM A SANITARY STANDPOINT.

Dr. Felix Formento . . . . . New Orleans, La.
Dr. C. O. Probst . . . . . Columbus, O.
Dr. E. P. Lachapelle . . . . . Montreal, P. Q.

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ON THE RELATION OF FORESTRY TO PUBLIC HEALTH.

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Dr. Salvador Garciadiego . . . . . Guadalajara, Jalisco, Mex.
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ON TRANSPORTATION OF DISEASED TISSUES BY MAIL.

Dr. HENRY MITCHELL . . . . . Trenton, N. J.
Dr. E. P. LACHAPELLE . . . . . Montreal, P. Q.
Dr. DOMINGO ORVAÑANOS . . . . . Mexico, Mex.

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ANNUAL REPORT OF THE TREASURER OF THE AMERICAN PUBLIC HEALTH ASSOCIATION, FOR THE YEAR ENDING SEPT. 24, 1894.

HENRY D. HOLTON,
IN ACCOUNT WITH
THE AMERICAN PUBLIC HEALTH ASSOCIATION.

RECEIPTS.

1893.		
Sept. 26.	Cash on hand	$2,154.37
	Cash from sale of Transactions	74.00
	Cash from dues of members	1,405.25
		$3,633.62

DISBURSEMENTS.

Oct. 30.	Henry D. Holton, treasurer, expenses of president, secretary, and treasurer, as per bill, order No. 10	$176.50
Oct. 30.	Henry D. Holton, treasurer, expenses and amount voted treasurer, order No. 11	148.70
Oct. 30.	S. H. Durgin, president, expenses as per bill, order No. 12,	55.00
Oct. 30.	Irving A. Watson, secretary, expenses as per bill, order No. 13	52.00
Nov. 21.	Silsby & Son, stationery, as per bill, order No. 14	103.60
Nov. 21.	William Whitford, reporting Chicago meeting, as per bill, order No. 15	96.40
Dec. 12.	Morton, Phillips & Co., envelopes as per bill, order No. 16	3.00
Dec. 29.	Vermont National Bank, desk for secretary as per bill, order No. 17	57.60
1894.		
May 22.	American Express Co., distributing Transactions of Mexico meeting as per bill, order No. 18	86.80
Aug. 10.	Republican Press Association, for printing as per bill, order No. 19	1,354.89
Sept. 24.	Henry D. Holton, treasurer, money paid out as per bill, order No. 20	131.39
Sept. 24.	*Cash on hand	1,367.74
		$3,633,62

HENRY D. HOLTON, *Treasurer.*

* This includes Index fund, $793.98.

Your auditing committee, to which was referred the report, accounts, and books of the treasurer for examination, report that it has performed its duty, and has found everything correct.

J. N. McCORMACK.
HENRY T. BAHNSON.
C. A. LINDSLEY.

September 27, 1894.

SANITARY AUTHORITIES AND ASSOCIATIONS

OF THE

UNITED STATES OF AMERICA, THE DOMINION OF CANADA, AND THE REPUBLIC OF MEXICO.

1896.

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Treasurer, Dr. Henry D. Holton, Brattleboro', Vermont.

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Vice-President, Dr. Benjamin Lee, Philadelphia, Pa.
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UNITED STATES MARINE HOSPITAL SERVICE.

Supervising Surgeon-General, Dr. Walter Wyman, Washington, D. C.

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The Superior Board of Health.

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Vocal, Dr. Juan J. R. de Arellano, San Hipólito 21.
Vocal, Dr. Luis E. Ruiz, Pte. de S. Pedro y S. Pablo 14.
Vocal Médico Militar, Dr. Ferdinand López, 1a. de Mesones 11.
Vocal Medico Veterinario, Professor José L. Gōmez, Cocheras 12.
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Vocal Abogado, Lic. José M. Gamboa, Donceles 29.
Vocal Ingeniero, Ing. Roberto Gayol, Cerrada de Santa Teresa 4.

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Médico Jefe del Servicio, Dr. Jesús González Vázquez. Acequia 25.

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De Tepic, Dr. Cárlos Fenelón, Tepic, Territorio de Tepic.
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Adjunto, Dr. Manuel M. Hidalgo, La Paz, Territorio B. Cal.
Escribiente, Sr. Miguel Ortuz, La Paz, Territorio B. Cal.

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(This state formerly had a state board of health, but has allowed it to become extinct, from lack of appropriations.)

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(Has no state board of health.)

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(Has no state board of health.)

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TEXAS.

Dr. R. M. Swearingen, Austin, *State Health Officer.*

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Has no Board of Health or any board or organization of a similar character.

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WYOMING.

Has no state board of health, the matter being left to the cities, some of which have such bodies appointed by ordinance.

During the legislative session of 1895, a bill was introduced creating a state board of health, which was killed in the committee.

SANITARY ASSOCIATIONS.

CALIFORNIA.

State Sanitary Convention is held under the auspices of the State Board of Health.

Dr. C. W. Nutting, Siskiyou Co., *President;* Dr. C. L. Bard, Ventura, *Vice-President;* J. T. McLean, Alamed, 2nd; Dr. Winslow Anderson, San Francisco, *Secretary.*

THE ILLINOIS STATE BOARD OF HEALTH AUXILIARY SANITARY ASSOCIATON.

Organized May, 1894; holds its meetings annually in May.

Dr. J. W. Scott, Springfield, *Secretary.*

IOWA PUBLIC HEALTH ASSOCIATION.

Prof. Floyd Davis, Ph. D., DesMoines, *President*; Dr. J. M. Emmert, Atlantic, *First Vice-President;* Dr. I. S. Bigelow, Dubuque, *Second Vice-President;* Dr. P. J. Fullerton, Waterloo, *Secretary and Treasurer.*

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THE STATE ASSOCIATED HEALTH AUTHORITIES OF PENNSYLVANIA.

His Excellency, Daniel H. Hastings, governor of Pennsylvania, *ex-officio President;* Crosby Gray, Pittsburgh, *First Vice-President;* Dr. J. S. Hunt, Easton, *Second Vice-President;* A.M. Sloan, Esq., Greensburg, *Third Vice-President;* Dr. Wm. B. Atkinson, 1400 Pine Street, Philadelphia, *Secretary*; Jesse C. Green, D. D. S., West Chester, *Treasurer.*

Executive Committee: Dr. Benjamin Lee, Philadelphia; C. P. Weaver, Norristown; Dr. A. H. Halberstadt, Pottsville; Dr. J. G. Shoemaker, Phœnixville; J. A. McLaughlin, Allegheny; the president and secretary, *ex officio.*

EXECUTIVE HEALTH OFFICERS' ASSOCIATION OF ONTARIO.

Willis Chipman, C.E., Toronto; Dr. R. Carney, Windsor; Alan MacDougal, C.E., Toronto; Dr. Allan Cameron, Owen Sound; Dr. S. Stewart, Thamesville; Dr. E. E. Kitchen, St. George; Dr. J. J. Cassidy, Toronto; Dr. Francis Rae, Oshawa; Dr. C. McDonald, Tilsonburg; E. Jackson, Tilsonburg; Dr. Peter H. Bryce, Toronto; Dr. F. H. Mitchell, Delaware; Dr. T. L. McRitchie, Harwich; Dr. William R. Hall, Chatham; Dr. Harry E. Vaux, Brockville; Dr. J. D. Macdonald, Hamilton; Dr. Robt. Paul, Delaware; Dr. James H. Duncan, Chatham; A. H. White, Chatham; Dr. W. R. Nichols, Baden; Dr. David J. Minchin, Berlin; Dr. Charles Sheard, Toronto; Dr. T. V. Hutchinson, London; Dr. W. J. Coventry, Windsor; Dr. J. B. Lundy, Preston; Dr. D. P. Bogart, Whitby; J. Dearness, London; Dr. M. McCrimmon, Palermo; Dr. W. W. Hay, Wallaceburg; Dr. George T. McKeough, Chatham; Dr. J. A. McLeay, Watford; Dr. Chas. Chamberlain, Leamington; Dr. C. B. Langford, Blenheim.

THE RUSH MONUMENT.

My Dear Doctor:—The remarkable success of the relatively small body of homeopaths in the United States, in collecting $75,000 for their monument to Hahnemann to be erected in the City of Washington, ought to make every reputable regular physician in the country keenly alive to the necessity for promptly subscribing to the fund for the long-delayed monument to Benjamin Rush.

The model for the monument to Hahnemann, which has been on exhibition in New York City, has attracted general admiration on account of its great beauty and artistic excellence, which will make it unrivaled as a work of this kind.

The regular medical profession, numbering over one hundred thousand more than the entire body of homeopaths, has thus far subscribed less than $4,000 towards the projected monument to Dr. Rush, for which the navy department has already generously designated a commanding site in the park fronting the U. S. Naval Museum of Hygiene, where it will be one of the most conspicuous features of the national capital.

Are the regular physicians of the United States willing that this illustrious signer of the Declaration of Independence and the distinguished medical hero of the Revolution, shall be commemorated by an insignificant bust or a mediocre statue, in pitiable contrast with the splendid testimonial at their capital city to a foreign theorist by a comparatively small body of his misguided followers? The crowds of visitors to Washington cannot fail to attach a disparaging significance to the spectacle of these two monuments; and we appeal to you to aid the committee in its endeavor to do justice to the memory of this great father of American medicine, pure and undefiled, by sending by *return mail* to either of the undersigned, as large a contribution as you may be able to make.

Albert L. Gihon, M. D.,
Chairman R. M. C., 8 West 127th Street, New York City.
George H. Rohé, M. D.,
Secretary and Treasurer R. M. C., Sykesville, Md.
W. Murray Weidman, M. D.,
Chairman of R. M. Committee for Pennsylvania, Reading, Pa.
Henry D. Holton, M. D.,
Treasurer American Public Health Association, Brattleboro, Vt.
Charles McIntire, M. D.,
Secretary-Treasurer American Academy of Medicine, Easton, Pa.

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PRESIDENT'S ADDRESS.[1]

By Dr. WILLIAM BAILEY, Louisville, Ky.

Mr. Vice-President, Members of the American Public Health Association, Ladies and Gentlemen:

Allow me to acknowledge before this audience the high honor conferred upon me by being elected to preside over this association for the year closing with this meeting in Denver. It is an honor of which any man might well feel proud, for this international association is recognized as among the largest and most influential of its kind in the world.

Enrolled in its membership and among its active promoters and workers are the most illustrious sanitarians of this continent. I shall not weary you by an attempt to give its history or tell of the work it has done, for this has been done by abler pens than mine and such history forms a part of our published records, read and known of all men.

I congratulate the association upon its meeting in the "Convention City," the Queen City of the Plains, the beautiful city of Denver in the wonderful state of Colorado, fit Centennial state, with advantages as yet untold, with a climate that will challenge the admiration of these sanitarians as perhaps none other can, with an atmosphere of marvellous purity, almost sterile as to pathogenic germs, and without the necessity of international agreement of unlimited coinage, the coin of the realm, the parity of which is guaranteed and maintained by the fiat of the Almighty himself.

If I shall overstate anything in regard to Colorado or Denver, I will ask you to remember the visit of your invitation committee who visited my city two or three weeks ago, bearing your kind invitation to the G. A. R. to meet in Denver in 1896. I shall discount no statement made by them.

[1] Denver meeting American Public Health Association.

In 1859, when I was a youth, as you may well know, I was visiting the city of St. Joseph, Mo., and I there beheld such a sight as I have not witnessed since. I saw the immense trains returning from Pike's Peak and Colorado, and perhaps from Denver, and such a dejected, disappointed body of men I had never seen. You remember possibly the famous motto emblazoned on the covers of many of the wagons, "To Pike's Peak or Bust."

I thought at the time that they had failed to reach their destination but had little doubt about the alternative. From the immense number of them I thought they had all returned, but I am now convinced that many did not, and have found more than they looked for.

I must desist from this line of thought for the association does not permit its influence to be used for the booming of any local interests.

I beg leave to express the thanks of the association to the people of Denver for your interest in our work as evidenced by your kind invitation to meet in your city, by your generous and unbounded hospitality, and by your presence in such numbers this evening. I extend to you a cordial invitation to be present at these sessions and will promise that you will find much to interest any one who is enlisted in any way for the betterment of his kind.

You are already well informed as to the advantages that accrue from well-directed sanitary effort. You have had a valuable object lesson in a fifty per cent. reduction in the death rate in your city in the last five years. Our association is largely educational and almost invariably an impetus is given to sanitary work in the cities and states in which we meet. We stir up your minds by way of remembrance if nothing more.

Members of the association: We are met under the most favorable auspices. Everything conduces towards a pleasant and profitable meeting.

No great or alarming epidemics have prevailed within our borders.

Mutterings of the dread march of cholera come to our ears from the Orient but by way of the Golden Gate. It is to be hoped that the efficient forces of California, supplemented, if need be, by the general government, will be able to successfully resist any occupation of our territory.

In this connection I would urge the association to redouble its diligence in its effort to have established a department of health for the government of the United States.

It seems incomprehensible that those concerned with legislation are about the only ones who cannot be brought to a realization of this the highest demand of statesmanship, namely, a proper care and regard for the public health. Gladstone styles it the highest office of statesmanship. A well-equipped health department in the government of the United States would be a great power for good. It is a necessity for the most successful management of maritime quarantine. Under the advanced ideas of sanitation, quarantine is no longer a detention of forty days.

It is found to be much better to prevent the disease from leaving its home by inspectors than to combat it after it has landed on our shores.

The government, through its own officers, at all ports from which infectious diseases are likely to come, can better protect itself than in any other way by the thorough inspection of everything that can convey disease.

Let everything that comes to our shores be with clean bills of health from our own officers and there will be but little use for our large plants for disinfection.

Quarantine is now practically inspection, disinfection, and detention of suspects during the incubative period of the disease. However, this subject of quarantine is but a small part of the work of a public health department.

What a valuable work could be done under such auspices in the study of the nature and causation of the contagious and infectious diseases! Other governments than ours have not failed to see the advantages, nor been slow to avail themselves of the benefits growing out of such investigations. Professor Koch has never been handicapped for want of means or opportunity for investigation. His work has always been under the fostering care of his government. What is the government of the United States doing for the elucidation of these questions which are of paramount importance to every citizen? We have men as able and as competent as any who would willingly engage in work of this kind if they were relieved of the ever-present and oppressing necessity for bread winning.

Think of the time and money expended in the study of the diseases of the lower animals and plants and how little in the consideration of the diseases of man. I would not have less attention given or less work done by the department of agriculture, but by virtue of the higher object to be obtained would give the more heed to this.

For a more complete presentation of this subject I beg leave to refer you to the address of our worthy treasurer, Dr. Holton, at the May meeting of the American Medical Association, in Baltimore. You will have in the reports of your standing committees, and voluntary papers presented, an abundance of material for your consideration.

Particularly have I looked forward to the report on the pollution of water supplies, Dr. Smart chairman.

In the first place, no subject can more interest us than that looking toward the purification and protection of our drinking water. The list of water-borne diseases is so large, and the diseases themselves so common and so fatal in character, that no more important work can engage your attention. Essential work has been undertaken by your committee this year, to the end that order may be brought out of chaos; that the ships may be at least cleared for battle. Hitherto much confusion has characterized the bacteriology of water.

If all that the most sanguine hoped for has not been accomplished, yet let us feel that necessary steps have been taken, and that progress

has been made. I hope the Association will see fit to foster this coöperative work until success complete shall crown the effort of your committee.

I beg leave to call the attention of the Association to an experience as your chief officer. In my correspondence with the representative men of the Association, I find many of the college men were unable to avail themselves of the privilege of attendance at this meeting on account of their professional duties. These men can attend better in the month of September, or later, after the session is well under way. Some attention should be given to this subject, for we lose the aid of some of our best men.

The great question of the day for sanitarians, it seems to me, is that of immunity. The possibilities in this direction may exceed our wildest imaginings. What seemed but a dream to us only a few years ago may now be accomplished. We are in the midst of a great revolution in the management of disease. We are day by day arriving at more definite knowledge concerning the essential nature of disease processes, and are cultivating more closely the field of causation. This is, perhaps, the most important department of medicine. Management of disease must become more rational and more efficient as we advance in the knowledge. Unfortunately nothing in recent discovery rivals vaccination. Here we have absolute demonstration so oft repeated and so clear that those only can doubt who *will* not to believe.

It will be fit for this Association to perfect its plans for some memorial celebration of the discovery of the immortal Jenner. I know of no better way than that a suitable committee should prepare a report for our next session which shall ably set forth the perfection of the immunity from small-pox by vaccination, and under proper restrictions its absolute safety. No single discovery of any age has saved so many lives nor mitigated so much of human suffering as has this of Jenner. We must acknowledge that many of us have become too neglectful of its advantages, and now many communities have a large number of people who are not immune. But little attention is paid to vaccination until a case of small-pox occurs, and it is then found that the danger is much greater than it ought to be because so many persons have not been vaccinated. Small-pox ought to be regarded as a disgrace to the city, town, or country in which it occurs. Many reasons, however, may prevent beside mere negligence. It may be that compulsory vaccination laws have in some instances stimulated the resistance of the ignorant, who imagine, or have been taught by designing ones, that it is better to suffer the ills of small-pox than fly to those they know not of.

Let this report set forth in proper manner the blessings of vaccination, and at the same time demonstrate its safety, and it will be a fitting memorial to Jenner and bring safety to thousands of people, who will be vaccinated because of the public attention to the subject by this means. Small-pox ought to be blotted off the face of the earth, and could be in less than a generation.

What shall I say in regard to immunity from the several infectious diseases now occupying so much of public attention? It is possible that the day will come when we can protect men from such diseases as cholera, typhoid fever, scarlet-fever, diphtheria, and consumption. I will express the opinion that it is not only possible but that there is hope that not many years will elapse before we will be affording immunity from these diseases as we now do from small-pox by vaccination. Consensus of intelligent opinions confirms the truth of the germ theory of disease.

Allow me to stop long enough to say that the man to whom we owe so much in this direction lies dead to-night, mourned by a nation and a scientific world.

In some diseases the germ itself seems to be an important factor in their production, constituting what is known as bacterial infection, but in most of them this does not seem to be the *modus operandi*. In these it seems to be by bacterial intoxication, the germ itself not being directly concerned in the production of the disease phenomena, but producing, perhaps, as its physiological product, a toxine, which is absorbed and affects the body as a similar poison would if introduced by hypodermic injection. Indeed, it is possible to cultivate the germ in artificial media, collect its posion, and introduce this into the system and thereby produce all the symptoms of a germ disease without the germ itself having been in a hundred miles of the patient. It is, I believe, generally accepted that when the body of an animal is stimulated to resistance by these toxines, by cellular action, it is capable of producing elements that are antidotal, or antagonistic to these toxines. Hence, in a general way, these poisons are spoken of as toxines, and nature's remedies as anti-toxines. This is the basis of modern serum-therapy and likewise of serum-prophylaxis.

To illustrate by a single disease: A culture of the Klebs-Loeffler bacillus is injected hypodermically into the horse in increasing doses until the cellular action of the animal has produced Behring's anti-toxine to the extent that it is said to be immune, or poison-proof, so far as this toxine is concerned. This anti-toxine is standardized by finding out how much of it is necessary to prevent death when toxic doses have been administered, hence it is rather prophylactic than curative. The doses administered to the horse in the last weeks of his treatment for immunization could not safely be given to him in the beginning, for then he would not be able to produce the anti-toxine in sufficient quantity, or with sufficient rapidity, to antidote the poison.

The serum of the immunized animal possesses an anti-toxine that gives immunity to the animal that receives it. An animal stimulated by a specific toxine produces the antidote for that poison alone, hence there cannot be universal anti-toxine.

It is urged against both serum-therapy and prophylaxis that the serum of an animal of one species is destructive to the blood corpuscles of an animal of another species, and that there is danger of embolism under

the same circumstances. These and many other questions are yet subjective, but I have confidence that all obstacles will be overcome and that finally it will be well with serum immunity. It is also urged against it that the exemption is for a limited period of time. It should be remembered that an attack of some of these diseases does not exempt for any but a limited period. We cannot reasonably expect the immunity from serum to last longer than it would from an attack of the disease. Elsewhere I had occasion to say that we do not hesitate to secure for our patients the prophylactic influence of the salts of quinia because, forsooth, you cannot secure exemption from malaria for all time by the administration of these salts for one season.

Ladies and gentlemen, I have satisfaction in saying that I have read to you the shortest, if not the best, presidential address ever delivered to the American Public Health Association.

ADDRESS OF WELCOME.

By Hon. A. W. McINTIRE, Governor of Colorado.

Mr. President and Members of the American Public Health Association:

I take great pleasure in welcoming you to the state of Colorado. This state, and particularly within its capital city, Denver, has been the scene of many conventions, but no convention that has met here and honored us with its presence is of greater importance and value both as to subject-matter and in the benefit to result from your deliberations than the association which we welcome to our midst at this time. The distinction between what I might call private health and public health, that is, the health of the individual and that of the sum total of individuals, is a distinction which I need not here define. You, as physicians, have all dealt with the health of individuals with more or less success. It is only comparatively within recent times that the public health has been a matter of very great interest, and which has been given the advantage of scientific study. We know that those who devote themselves to this sort of study, and particularly the great and disastrous epidemics of the past, have done much to prevent their occurrence in these days, and epidemics are becoming more and more improbable in their occurrence. The people are becoming more and more satisfied with the medical profession, particularly those who are directing their energies in the line of this particular subject. You are not only able to protect us as individuals, but as a whole community. So important is this matter that I was about to say that even now the public health is not a subject of sufficient public interest. There are those, and I do not know but what they are theoretically correct, who believe and hold that the public health officers are not a part of the executive department of the state. It seems to me, if they are not, they should be speedily elevated to that position, not in order to do them honor, but for the interest of the state and for the public welfare. [Applause.] We appreciate the advantages of health and the general remedies given in those diseases which affect a large number of the community. We point with pride to our climate as one of those general remedies which we have found to have beneficial effects. You are specially qualified for this work, and I hope your deliberations will be fraught with great profit. As I have to leave in a few minutes, I will turn this audience over to those who can better entertain and instruct it than I can. Again, however, I heartily welcome the association to the state and its capital.

ADDRESS.

By Hon. T. S. McMURRAY, Mayor of Denver.

Mr. President and Members of the American Public Health Association, Ladies and Gentlemen:

The pleasant duty devolves upon me to welcome you to the city of Denver, whose chief executive I have the honor to be. You are welcomed each one individually, as we welcome all who come to see us. You are also welcome in your collective capacity, because that which brings you here is something which demands the attention of all thoughtful men and women. The question of the health of a community or communities is one which in importance overshadows everything else that may come before us. Away back in the early days of the history of our race, the first born of man asked a question which has reverberated down the ages from that time until now, "Am I my brother's keeper?" That question is answered, and we are asking ourselves that question and are being continually called upon to answer that we are our brother's keeper in so far as it is within our power to guard the life and health of those around us. It devolves upon us to exercise all the powers that may be in us to accomplish that desirable thing. And so as members of this health association, devoted to the science of sanitation, you have met to consider all those questions which go to guard the health of any community. You are met together to talk over these questions, and you have one of the most important themes that can come before any body of men, namely, the health of the people.

As executive officers of a city, we are interested in the carrying on of philanthropic work. Your highest aims are to make our cities healthful, to lower the death rate, and above all things to alleviate human suffering. I need not tell you that human life stands preëminent, and so, if in the course of your discussions or deliberations you are able to bring into operation something that will save one human life in each community from which you come, your meeting will not have been in vain. Whatever may be the different lines on which you operate, whether it be for the prevention of the contagious diseases that sweep over our land in epidemic form and carry away thousands in their march, or whether it be the ordinary course of life, you are doing that which is best for the welfare of those who are around you. We trust that your short sojourn here will be pleasant and profitable, and I am sure that your deliberations will be very interesting to the public. As you discuss the great questions that come before you, we ask you to bear in mind the importance of a welcome to this city; we trust that you will have a pleasant time while you are

with us, and that your deliberations will redound to the welfare of every one in this community and the community from which you come.

I extend to you on behalf of the citizens of this city, and particularly in behalf of the medical fraternity, a hearty welcome to our city. We trust that you will have been so pleased with your sojourn that you will come back and visit us in the days to come.

REMARKS.

By Rev. CHANCELLOR McDOWELL, of Denver.

GENTLEMEN:—I was kindly asked by my friend, Dr. Henry Sewall, chairman of the local committee of arrangements, to add a few words to what has already been said by the executive officers of the state and city. Usually, I do whatever the doctor says. I am afraid that this public health business has caused a great many of us to feel uncomfortable. Indeed, I am afraid to start out on the street for fear I will meet a microbe with a club, and it would be more agreeable if we did not have to dodge microbes all the time. We are told that there are microbes in what we eat, drink, and wear. They are present everywhere. It is no longer safe to go into a house or go out of one. It is no longer safe to ride in a street car or to walk, just because physicians have told us that in every community these microbes are let loose, and there seem to be but two things to do. One is to give the public health the right of way in the interest of public safety. If there is anything lacking in the way of legal restraint in this matter of health, then the executives of our cities should see that such a want is immediately supplied.

I was brought up under Thomas Jefferson's principles, and I am as firm a believer in the principles of personal liberty as any man needs be; but there comes a time in this matter of public health when personal liberty needs not only a small amount of personal restraint in the interest of the public health, but of the welfare of the public. The familiar legend should be put in our street cars, "Do not spit on the floor, especially if you are a consumptive." Here is a man by my side, for instance, who tells the health officer that he will spit where he pleases. I do not suggest violent measures, but there are two things open, and one is the governor should have power to call out the militia in reference to all such men, or they should have the hose turned on them by the fire department. I mean to say just this, that there should be some means devised where personal liberty shall not conflict for the sake of the larger liberty or freedom which we all desire—that freedom from danger, disease, and death which our health officers ought to be empowered to secure for us.

If I had my way I would take this entire matter of the public health out of politics, for fear the health business itself becomes infected with germs. The business of caring for the public health in any community devolves upon the health officers. Talk about disease being contagious: Some-one has said, "Why did not God Almighty make health contagious?" With all deference to this remark, I will say that God Almighty did make health contagious. Nobody can clean up his front yard without compelling other people to do so. My neighbor cleaned out his gutter last

spring, and the next morning I had to clean out mine. I plead with those of you who stand on the outside to think of this matter of public health. It is your business by day and by night to join with and second every effort that is being made by the health officers of this city to cleanse and purify it.

Having said this much, I beg to reiterate, in brief, what has been said by His Excellency, the Governor of Colorado, and His Honor, the Mayor of Denver, that we are more than glad to have the American Public Health Association meet here in this great sanitarium of the continent. We want to know how to bring about the best possible conditions for those who come and those who are here.

REPORT OF THE COMMITTEE ON ANIMAL DISEASES AND ANIMAL FOODS.—NECESSITY FOR CO-OPERATION IN THE INSPECTION OF MEATS.[1]

BY D. E. SALMON, D. V. M., CHAIRMAN OF THE COMMITTEE.

The more we investigate the diseases of animals; the more we observe the condition in which meat producing animals arrive at our great stock-yards; and the more we learn of the principles upon which abattoirs are operated, the more positive becomes our conviction of the necessity for a rigid system of meat inspection.

From the point of view of the American consumer, the inspection of meat is not yet in a satisfactory condition. We have a federal meat inspection and a municipal meat inspection, each independent of the other, each conducted on different principles, and where the two accidentally come in contact there has oftener been friction and antagonism than friendliness and coöperation. Every member of this Association must feel that such a condition of affairs is radically wrong, and that it should be at once done away with, and a cordial, active, and efficient plan of coöperation established.

The American Public Health Association embraces within its membership nearly, if not quite, all the officials whose assistance is required to bring about this great reform. Municipal inspection can never properly protect consumers until it has the assistance which can be rendered by the federal government through its men, its money, and its jurisdiction over inter-state commerce. Federal inspection is equally lacking, because it cannot touch meat unless it is found in the channels of inter-state commerce, and even then, under the statutes now in force, the condemned meat may be sold for local consumption. As sanitarians we need to combine our forces, and so adjust them that the weak parts of one may be corrected by proper adjustment with the strong parts of the other.

Your committee does not hesitate to invite your attention to this subject, as the most serious and important of all the questions which have come before it since its last report was made. We appreciate that it is a delicate matter to handle—that to go into details unduly would suggest a charge of sensationalism, and might unnecessarily injure legitimate trade, while in avoiding these we may fail to make as strong an impression as is desirable. It is hoped that a conservative presentation of the subject will secure the sympathy and interest of the members of this great organization.

[1] Presented at the Denver Meeting.

The act of congress under which the federal inspection is conducted, provides for an inspection prior to slaughter of all cattle, sheep, and hogs the carcasses or products of which are to be transported and sold for human consumption in any other state or territory, or the District of Columbia. It is made unlawful for any person to transport from one state into another, either the carcasses or the food products of any of the animals named which have been examined and declared unsound or diseased.

There is nothing in this law, however, which prevents the owner from selling the condemned animals to be slaughtered for local consumption, or which interferes with their shipment to any other part of the country.

It must be evident that an animal which is not in proper condition to be slaughtered to produce meat for the inter-state trade is not in proper condition to be slaughtered for local consumption; nor is the condition of the animal likely to be improved by shipment to some other town or city either in the same or in another state. With proper coöperation, an animal condemned by the federal inspectors could not be slaughtered in the same city and the meat sold for local consumption, and if shipped to some other place, the health authorities, promptly notified, would be ready to take charge of it on its arrival.

The federal inspection does not make the task of the local health boards lighter than heretofore; on the contrary, it is made more arduous, and this fact should be clearly understood. The tendency is to slaughter condemned animals for local consumption, or to ship those which are likely to be condemned, to cities where there has been no federal inspection established. This withdraws animals, unfit for food, from slaughter for the inter-state trade, and puts them upon the local market. To protect this local market we must rely entirely upon the local boards.

It is possible for the same thing to occur with condemned meat as with condemned animals. The federal law allows this meat, no matter how dangerous it may be, to be sold locally for human food. The regulations of the Department of Agriculture have been drawn, however, with the idea of restricting as much as possible such sale of condemned meat. These regulations provide that in those cases where the owners of condemned carcasses do not consent to tank them, that such carcasses shall be branded with the word condemned, that a record shall be kept of their kind and weight, that they shall be removed from the packing house, and that the firm or corporation owning them, shall make a sworn statement monthly in detail, showing to whom sold, whether for consumption, for food or otherwise, with what knowledge if any by the purchasers of their condemnation, and whether before their sale their condition had been altered by cooking or in any other way. This was considered a necessary regulation to prevent the shipment of condemned meats to other states, but its effect will undoubtedly be to largely prevent the sale of such meats for human food by responsible firms. One firm, only, has taken advantage of this privilege of selling condemned meat locally and

has thus disposed of a number of carcasses rejected on account of pregnancy.

Under the federal inspection all animals and meats affected as follows are condemned: 1. Hog cholera; 2. Swine plague; 3. Anthrax; 4. Rabies; 5. Malignant epizootic catarrh; 6. Pyaemia and septicaemia; 7. Mange or scab in advanced stages; 8. Advanced stages of actinomycosis, or lumpy-jaw; 9. Inflammation of the lungs, intestines, or the peritoneum; 10. Texas fever; 11. Extensive or generalized tuberculosis; 12. Animals in an advanced state of pregnancy, or which have recently given birth to young; 13. Any disease or injury causing elevation of temperature or affecting the system of the animal to a degree which would make the flesh unfit for food.

For the above conditions the entire carcass is condemned. In addition to this any organ or part of a carcass which is badly bruised or affected by tuberculosis, actinomycosis, cancer, abscess, suppurating sore, or tape worm cysts must be condemned.

Considering that the inspection has only recently been inaugurated, this list of causes for condemnation is as comprehensive as should be expected. There are some, however, who criticise the inspection for being too rigid, and others who are equally positive that it is not rigid enough. Your committee is of the opinion that, in the present condition of the inspection service, it is wise to avoid extremes, and that it is more important to secure the rapid and unimpeded extension of this inspection to all parts of the country, where animals are slaughtered for the inter-state trade, than it is to make the inspection more severe and onerous in places where it is now in effect.

The difficulty in the way of a uniform system and coöperation between the federal and local authorities is not that the regulations of the former are too lax, but is found in the indisposition of the latter to enforce or assist in enforcing a systematic inspection. There may be a few cities to which this statement does not apply, but they are very few. This lack of systematic local inspection is no doubt for the most part due to lack of funds. In cities where the federal inspection is established great benefits could be secured from this without increased expenditures by making it a punishable offense to sell the condemned meat, or to slaughter the condemned animals, and sell their products for human food. A few convictions would break up this practice.

There should, however, be an increased force of meat inspectors in most cities. Small slaughter houses which do a strictly local business and which are in the hands of unprincipled parties are too numerous, and all such should have the strictest supervision. To reach these it is necessary that there should be inspection at all abattoirs. When animals are condemned as unfit to be slaughtered for the inter-state trade, there should be no avenue left open by which they may reach the consumer; nor should the shipper of stock be able to avoid inspection by shipping to one place rather than another.

Too often the local inspection takes cognizance of but a few conditions. Lumpy-jaw cattle and badly injured animals are severely dealt with, but how many hogs are condemned for cholera? how many sheep for scab? how many cattle and hogs for tuberculosis? how many animals for pregnancy or parturition? how many for metritis, peritonitis, septicaemia, pyaemia, and other conditions equally loathsome and dangerous to the consumer? There should be severe penalties imposed upon any who are reckless enough to sell to innocent purchasers, the meat of animals in such conditions, and there should be in addition the safe-guard of a rigid inspection.

Your committee does not consider it practicable, at least for the present, to undertake to protect consumers from trichinous pork by microscopic inspection. The federal trichinae inspection has been a commercial inspection, made with the purpose of placing American pork in certain markets which require such an inspection, but not with any idea of protecting American consumers. To microscopically examine every car cass in this country would be a tremendous undertaking, and would require an enormous expenditure. There are about thirty million hogs slaughtered in the United States annually. If these could be inspected for six cents each the total cost would be $1,800,000. The loss to the trade from condemned carcasses would be much greater than this. Even then, trichinosis in people would not be prevented and it is not certain that the number of cases would be reduced. It is impossible to find all the trichinous carcasses by any method yet devised. This is not accomplished in Germany where microscopic inspection has been established for a long time, and where a most searching examination is made. The effect of a general microscopic inspection would be to establish a feeling of security, leading to greater consumption of raw and underdone pork, and the few carcasses in which the trichinae escaped detection would cause more infections than the same number do now. Is it not much better to teach our citizens the necessity of thoroughly cooking pork, and thus protecting themselves more efficiently than they can be protected by any system of inspection?

As horses have become of less value than heretofore, establishments for the slaughter of these animals are beginning to operate in different parts of the country. It is not our purpose to discuss the relative wholesomeness of bovine and equine flesh as articles of diet, but we assume that if inspection is an important means of protecting the consumer of beef, this precaution is even more essential to guard consumers from the dangers that may be concealed in horse-flesh.

One of the most common and incurable diseases of horses is known as glanders. It is communicable to man and in him is a most loathsome and fatal malady. The presence of this one disease of horses in all parts of the country, is a sufficient reason for forbidding the slaughter of these animals with a view of selling their flesh for human food unless they are inspected before and at the time of slaughter by competent veterinary

inspectors. But an additional reason for inspection is the well-known fact that it is generally broken down and diseased, rather than sound and healthy, horses which are used for this purpose.

Unfortunately, the federal inspection is limited by the statutes to cattle, sheep, and swine, and cannot properly be extended to horses. Their flesh may consequently be prepared, shipped, and sold without inspection and without the violation of such laws. Our sanitary authorities owe it to the public, however, that this meat be sold for what it really is, viz., uninspected horse-flesh.

The secretary of agriculture has recently made an order requiring all meat shipped abroad to be either inspected or plainly marked to indicate the species of animal from which it is produced. This is done under the law which authorizes the inspection of all exported beef. A similar requirement might be made for meat shipped from one state to another, but would only be a protection in case the local health officers coöperated with the inspection service of the general government. Otherwise, the marks would be removed before the meat was sold and it would then, as now, be sold to the consumer as the flesh of the ox.

Your committee asks attention to these several points not because they are new or unknown, but because they demonstrate the importance of an extension of active sanitary work to guard consumers from the dangers of unwholesome meat. The establishment and extension of the federal meat inspection make coöperation feasible, and present the only practicable means of securing a thorough and efficient system of meat inspection. In our opinion the subject is a timely one and should receive immediate consideration from boards of health in all parts of the United States.

DISCUSSION ON THE REPORT OF THE COMMITTEE UPON ANIMAL DISEASES AND ANIMAL FOODS.

Dr. P. H. Bailhache, of New York.—I merely wish to remark that the inter-state law spoken of was drawn as close as it could be for the protection of local sanitation of domestic animals, but under our form of government it was found impossible for the federal government to step into any state or town and undertake to say what meat shall be slaughtered until the cattle were thoroughly inspected. It is only with reference to the transportation from one point to another that the government has any right to do anything.

Dr. Carl Weidner, of Louisville, Ky.—I simply rise to take exception to one remark in the report. I cannot endorse the statement that the inspection of pork for trichina is entirely inadequate or useless. I think that the consumption of all trichinous meat ought to be prohibited, as much as possible, still it has been sold for years and years. While it is our duty to instruct the public, it is also our duty to protect the people, to urge and demand a rigid inspection of pork, and I am sure by so

coing we will detect trichinae in a great many instances, and point out that at the sellers of such infected meat are liable.

Dr. C. N. Hewitt, of Red Wing, Minn.—Being associated with Dr. Salmon more or less, I wish to say a word or two in reference to this matter from the standpoint of a health officer. Dr. Salmon assumes that nothing is being done except by himself and the local anthorities who are in sympathy with him. For the past three years he has been supplying the state board of health of Minnesota with tuberculin and mallein, and these agents have been used in large quantities by the local departments of health for the detection of tuberculosis and glanders. Over one thousand animals, suspected of tuberculosis, were tested by the use of tuberculin under the direction of our state board of health. Inspection between the state and the nation can be easily arranged, if the national and state authorities are faithful. We do not have any difficulty in getting the coöperation of Dr. Salmon and his department and we coöperate with him. We can avail ourselves of his services, and his recommendation is to do so. It is the practical way to solve the problem. It is successful, so far as we have gone, and I hope my brethren of the other states will try to do the same.

Dr. J. J. Kinyoun, of Washington, D. C.—I rise to say one or two words. While endorsing in the main the report of the committee, of which Dr. Salmon is chairman, in regard to inspection of infected meats, I do not believe there is enough emphasis laid upon the subject of tuberculous meat, either in the bovine or in the swine species. If we will carefully read the report of the British commission on tuberculosis, I think we will come to the same conclusion as that advanced by Dr. Salmon, that while in the greater number of cases we can detect tuberculosis by the tuberculous glands, we cannot be sure that by excluding certain parts infected with tuberculosis, we can exclude all the tubercle bacilli in that class. Even in the animal, where only glands are infected, the carcasses are dangerous and should be destroyed, and as long as we shut our eyes to the conditions, as set forth by the bureau of animal industry, we are going to invite tuberculosis through infected meat.

Dr. H. N. Avery, of Minneapolis, Minn.—In relation to this matter of detecting tuberculous meat in cattle, and also the detection of swine fever and cholera in hogs, it seems to me that nothing but inspection by local health officers can ever prevent the consumption of these meats. For instance, you might have state or national inspection, but here are a great many farmers scattered over the country who are raising hogs with either hog cholera or swine fever. If they notice the swine are weak in the legs, what do they do? They slaughter them and bring them to the local market for sale. How are the national inspectors going to detect it? Therefore, it seems to me nothing short of local inspection by the health officers or by the meat inspectors of municipalities should be instituted in order to be able to detect this meat.

In regard to tuberculosis in cattle, I think probably that Minnesota has had as much experience as, if not more than, any other state in the Union. Dr. Hewitt has been active for the last ten or fifteen years in this matter and Minneapolis has within the last sixty days tested nearly 500 head of milch cows for tuberculosis, and there is only one way to eradicate this disease from the human family. We all know that tuberculosis is communicated from one person to another in three ways: (1) By the sputa, (2) milk of cows, and (3) the cheese and butter that may be produced. The only way to eradicate the disease is by the tuberculin test, which is the only infallible one, and nine times out of ten you will detect it in animals.

THE MICROSCOPICAL DIAGNOSIS OF DIPHTHERIA BY A NEW STAINING METHOD.[1]

By H. C. CROUCH, M. D., of Colorado Springs, Col.

The diagnosis of diphtheria by the microscopic examination of cover-glass preparations from the membrane is admittedly imperfect. By the ordinary method, we are obliged to rely upon the occurrence in large numbers on almost pure cultures of bacilli having certain morphological peculiarities, which, however, are not sufficient to distinguish them from other bacilli found in the mouth, if such are present in any quantity. A method which would give a specific stain, as with the tubercle bacilli, would evidently be of the greatest importance. Such a stain has not yet been found. Fortunately it is not necessary to have a stain so specific as to detect single diphtheria bacilli, for they are invariably present in a certain quantity if present at all. A method which will detect certain of them with some degree of certainty would be sufficient in most cases, and such a method, it seems to me, I have found. At least, if used with the proper precautions, and with sufficient skill, I believe from my experience with a large number of cases that this method will suffice to determine the diagnosis in a very large percentage of cases.

The diphtheria bacillus as seen in preparations from cultures consists of bacilli of varying sizes, the larger ones particularly presenting characteristic features in the way of club-shaped ends, and irregular staining, but all forms showing a tendency to the alternation of deeply and lightly stained portions. In addition to this and distinct from it, are certain round or oval bodies, which may be made apparent by certain methods, the existence of which was brought to our attention by Babes, Neiser, and Ernst. The method pursued by the latter was to stain strongly with hot methylene blue, and follow this with Bismarck brown. These bodies would be blue, the rest of the bacillus being brown.

I have been investigating the feasibility of employing this peculiarity of the diphtheria bacillus to differentiate it from other bacilli found in the mouth, and with a degree of success beyond expectation. I have found likewise simpler methods of staining, and peculiarities which I believe to have escaped attention hitherto.

If a fresh serum culture is stained momentarily with a one per cent. solution of methyl green it is often possible to bring out these bodies without further treatment. Treated thus they have the peculiarity of reddish granules in a faintly green bacillus, usually one at each end. By staining with methyl green more strongly and following with methylene blue, blue bacilli with red dots resembling spores will be seen. These

[1]Presented at the Denver meeting.

bodies have, apparently, a peculiar affinity for methyl green, with which they enter in a chemical combination, resulting in change of color from green to red. I have consequently employed methyl green for their detection. By adding other colors the penetration of the methyl green may be increased, and a double stain obtained immediately. I have found dahlia most useful, and employ in the following proportions: 1 part of one per cent. dahlia in water, 5 parts one per cent. methyl green, 4 parts water. If either color predominates in the stain too decidedly, the other color is cautiously added until the desired result as tested on the bacilli from a culture is obtained. The stain works instantaneously, and if too deep the effect is not obtained. In such a case the cover-glass may be treated quickly with Bismarck brown, which replaces the dahlia in the body of the bacillus, leaving the bodies described standing out in contrast.

I have tested this method on a large number of cases during the last six or eight months, and have never failed to find the result of the culture positive where I found these forms present in the cover-glass examination. In one case where I had diagnosed diphtheria, the first culture was unsuccessful, but the second culture which I had taken confirmed the diagnosis, which fact seems to me to indicate that the direct examination should always have its place in addition to the culture.

These bodies I do not consider to have any connection with spores, in spite of their superficial resemblance. They are found in the greatest numbers in young, freshly growing cultures, and are much less abundant in older cultures. They may be readily detected in cultures only a few hours old, and thus made use of to confirm a diagnosis earlier than the full development of the culture. That they are not degenerative forms is evident from the same considerations. I incline to attribute a nuclear nature to them, and propose the name nucloid bodies. They are evidently connected with the active growth, and are absent in the resting forms, suggesting thus the resemblance with indirect cell division. Being particularly abundant during the earlier and more rapid growth they are readily found in the earlier stages of the disease, and from the ease with which they may be brought out they acquire, it seems to me, a very great practical importance in the microscopical diagnosis of diphtheria.

DISCUSSION ON DR. CROUCH'S PAPER.

Dr. Charles V. Chapin, of Providence, R. I.—I would ask Dr. Crouch in what proportion of cases he has detected the presence of the diphtheria bacillus by the method he has detailed.

Dr. Crouch.—I have detected its presence in something over eighty per cent. of the cases, as confirmed by cultures; that is to say, I have been successful in making diagnoses in eighty per cent. of the cases.

Dr. J. J. Kinyoun, of Washington, D. C.—I have had some experience

in diagnosing cases of diphtheria, and for the last year I have been using a formula which is advocated by Dr. Roux, of Paris, which comprises methylene green and dahlia, and for culture work I find it acts very satisfactorily. It does not differ materially from the formula that has been recommended by Dr. Crouch. For those who are not expert in the diagnosis of diphtheria, I am inclined to think that the use of Küne's methyl blue, under ordinary circumstances, is best. It brings out the picture in the smeared cover-glass preparation very nicely. Where a man has had much experience in making diagnoses from day to day, I can commend the stains recommended by Dr. Roux as being not only reliable, but which will give the quickest results. The formula recommended by Roux is one dram of dahlia in ninety per cent. of alcohol, 100 c. c., one solution to every one dram of methyl blue, and ninety per cent. alcohol. Take one part of the dahlia and three parts of methyl green, as it acts better when it is fresh. It should not be used after one week's mixture. You can make up a quantity that will last for a year, have it always on hand, and you can get results from it in very much quicker time than by other methods.

I have had a great deal of difficulty in positively determining whether I had or had not diphtheria simply by making a cover-glass examination. While I have made diagnoses in seventy-five or eighty per cent. of the cases, to say positively that we have the diphtheria bacillus present in the membrane, or that we have the leptothrix, or some of the proteid forms, is difficult, and to my mind that has not been fully solved. I have used the methods that are obtainable, and still with all of them it is a question of doubt. I think, though, that we can always in the suspicious forms give antitoxin, but for the beginner, or those who have not many cases to examine, I am inclined to think on the whole that Loeffler's formula of methylene blue, instead of Küne's methyl blue, gives the best results.

THE MISSISSIPPI RIVER AS A SEWER.

By JOSIAH HARTZELL, Ph. D., Canton, O.

The subject under review suggests some observations; first in regard to certain vexations arising from river pollution in the several states of the United States; second, the present status of the same; third, possibilities in the future; fourth, remedies.

A community afflicted by an outbreak of disease appeals for assistance to the state board of health. If the disease is due to unsanitary conditions existing within a territorial area over which the state board has control, the causes of complaint are sought after, and, when found, are abolished. But if the outbreak is due to causes emanating from a territory outside the boundary of the state, the aspects of the case are changed in a very important particular. It is to complications of this character, arising from a divided political control of territory, that I wish to ask your attention.

A convenient illustration is found in the action of the Ohio legislature, as shown by the following, copied from the proceedings of that body, April 8, 1891:

> Whereas, the water supply of the towns and cities of the state bordering on the Ohio river is rendered impure and unhealthful by the sewerage and excreta emptied into the streams from the numerous cities upon both sides of the river, and
>
> Whereas, in consequence of this pollution, a scourge of diphtheria and typhoid fever has swept over many of our cities in eastern Ohio, resulting in much sickness, therefore, be it
>
> *Resolved by the General Assembly of the State of Ohio*, That the State Board of Health be requested to prepare a report to be submitted to the General Assembly as to the source of greatest danger from the causes above recited, and also what investigation would be required and what action should be taken in order to secure a purer water supply for the people of the river counties.

The Ohio board had already investigated a number of epidemics that had occurred in river towns and cities. The causes of these had been traced to polluted water supplies, the pollution having been derived partly from Ohio territory, and partly from cities above, and on the other side of the Ohio river. Intra-territorial sources of contamination were promptly suppressed.

The secretary of the board was directed to correspond with the secretaries of the state boards of health of Pennsylvania, West Virginia, and Kentucky, with a view to arranging for a joint meeting to discuss the question of pollution of the Ohio river and its prevention. Correspondence and meetings ensued, but the evil, the divided control, the variety of method where there is any method, these remain. The situation cannot be remedied by correspondence and meetings. With the increase in

urban populations, and the added drainage of cities, the rivers become filthier year after year.

The features of Ohio history, thus briefly alluded to, have, to a greater or less degree, characterized other states constituting parts of the great Mississippi basin. The Mississippi bisects this basin, receiving into itself 600 affluents which drain a water-shed area of 1,257,545 square miles. The coast line of the river and its navigable tributaries exceed 32,000 miles. These waters penetrate regions from which one third of the arable and other industrial products of the United States could be shipped to all parts of the globe.

The average slope of eastern rivers towards the Mississippi is three inches to the mile, of western rivers six inches. The fall from Cairo to the gulf is about two and one-half inches. In pre-glacial times the Gulf of Mexico extended north to a point above the mouth of the Ohio, having, in this part, much the shape of the Gulf of California of to-day. The alluvial lands, which have now taken the place of the open sea, constitute the garden spot of the earth. They have been brought down from hill and mountain, atom by atom, and dropped on the way by the slowly moving waters.

Within the memory of not very old men, it may be said that the waters of nearly all these streams were, if not pure, at least generally exempt from hurtful pollution. With railroads and the consequent concentration of people in towns and cities, the increase of water defilement has intensified prodigiously.

Sewers have as their object the collection and swift removal of city wastes. The effluent goes into the nearest available water. It therefore happens that sewers which, when rightly constructed, have their warrant in the soundest of hygienic impulses, also go concurrently hand in hand with the most concentrated form of river pollution, as now generally managed.

It may be said that the drainage of the entire valley must reach the river by gravity. While that is conceded, it is also true that the impurities reaching the stream through the medium of waters passing over, or through, land surfaces, are not apt, either in character or degree, to merit the charge of pollution. Impurities derived from vegetation or earthy salts have no particular significance, but if these impurities consist of the excreta of a dense population it is far otherwise. In addition to excreta, other serious forms of pollution do often reach these rivers. In a report on garbage disposal made to the American Public Health Association by Dr. Kilvington, health officer of Minneapolis, in 1889, this subject is discussed. Dr. Kilvington had interpolated the health officers of one hundred and seventy-five cities. A portion of the data thus obtained is summarized as follows:

In the Mississippi river, eight cities alone deposited, during the past year, 152,675 tons of garbage, manure, and offal, 108,250 tons of night soil, and 3,765 dead animals.

Into the Missouri river, four cities alone have cast, in the same twelve-month, 36,110 tons of garbage, manure, and offal, 22,400 tons of night-soil, and 31,160 dead animals.

Into the Ohio river, five cities alone dumped, within the same period, 46,700 tons of garbage, and offal, 21,157 tons of night soil, and 5,100 dead animals. (The night soil here referred to was derived from privy vaults.)

Recall the fact that a large proportion of these animals have been killed because they were suffering from glanders, farcy, hog-cholera, hydrophobia, pleuro-pneumonia, and tuberculosis, multiply these figures by the lowest possible multiple, and add to this great mass of decomposing material some thousands of miles of sewerage discharged into these three rivers, and the mind can form some dim conception of the degree of their pollution. No theory of self-purification of running water will suffice to dwarf the magnitude of this sanitary crime.

Having thus, most briefly and imperfectly, it is true, alluded to present existing conditions, the mind involuntarily busies itself with prognostications as to the future of the Father of Waters. If present practices are to continue, these would furnish the basis for at least a rational calculation of the probabilities affecting the case. Successive enumerations of urban and rural populations in the past furnish ratios of increase which, taken as a whole, admit of the ascertainment of the degree of potentiality of probable contributing factors at stated periods in the future. It may be observed that estimates of degree of future river pollution based on present methods, and previous rate of increase of population, would give a weak result as compared with the facts in the case, because, first, of the growing tendency of people to concentrate in cities, and, second, because of the great impetus recently given to sanitary works, sewer construction, and the prevailing efforts to deliver sewerage in concentrated form.

The calculation just suggested will not be attempted here. The general topography of the Mississippi water-shed, and its tributaries, its climate, soil, minerals, and possible capabilities are well understood. This great valley, already the home of a mighty people, is destined to be the theatre in which human achievement will one day attain to its point of utmost endeavor. Its territory is larger than Central Europe. China's 400,000,000 of people live within smaller and less fertile limits. The civilization of Egypt, which has been the wonder of the world for forty centuries, attained its greatness by the cultivation of less than 10,000 acres of the Nile valley. What shall be said of the Mississippi valley with its 800,000,000 of fertile acres, all lying within the temperate zone, equally removed from the lazy tropics and the northern ice, naturally favorable in every part to health and long life, to prosperity and happiness?

But along with people, in these latter times, comes trouble. People have drifted away from the example and injunction of Moses in disposing of their wastes. For the most part of a century they have been casting it into and befouling the waters of this once glorious system of rivers.

In the exigencies that may arise in the future, history will probably duplicate itself. Added impurities will more and more befoul the Mississippi system of waters until overt injuries to health enforce reform. Such has been the record of events in Germany, England, and other European countries; also in Massachusetts, and to a limited extent in New York and in other eastern and western states. Thirty years ago the pollution of English streams, and consequent prevalence of diarrhoeal afflictions, incited parliament to the creation of the Rivers Pollution Commission. Now the rivers of Great Britain have been restored to comparative purity. Notable improvement in the health rate has gone hand in hand with water purification. The published records of the English Commission, and of the Massachusetts State Board of Health, establish the fact that river purification is possible, and indicate in a general way the character of the engineering works required. A description of these processes of water and sewage purification does not come within the scope of this paper. The records of the American Public Health Association, and the comprehensive works of Geo. E. Waring, and of Baker and Rafter, are available to serious inquirers.

Drainage waters flow Mississippi-ward from points east almost as far as Buffalo, N. Y. Generally speaking the rim of the valley basin is the crest of the Appalachian mountain range on the east, and the Rocky mountain divide on the west. For more than one thousand miles across the northern boundary of the United States, there is an exceptional trend in the direction of water flow. The great lakes, with western influents creeping almost to the fountain heads of the Mississippi, intercept and bear these waters eastward to the Atlantic.

Lake traffic has been a factor of great importance in the growth of a chain of prosperous cities, namely: Buffalo, Erie, Cleveland, Toledo, Detroit, Saginaw, Bay City, Grand Rapids, Milwaukee, Duluth, and Chicago. This list comprises the cities having a population of more than 25,000. They aggregate 2,316,834, the whole being only 58,567 more than double the population of Chicago alone. These figures are from the census of 1890, and to-day Chicago would probably outnumber all the other South Shore lake cities combined.

The lakes receive the sewage of the cities and furnish their water supplies, methods which, taken together, are causing rapidly increasing trouble. The constant currents which wash the frontage of such cities as Detroit and Buffalo enable them, with properly located intakes and effluents, to elude contamination of water, by themselves. Many of the cities are not so fortunately situated; among the number is the great city of Chicago.

The detriment to health at Chicago, arising from the sewage-polluted water supply, has been recognized for some years. The typhoid percentage has been very high. Diarrhoeal afflictions during the period of ice frequently assumed epidemic form. Intakes were projected farther and

farther into the lake until the distance of four miles was reached. Even at that distance the water was, at times, found to be polluted.

An effort was made to improve the condition of the Chicago river by locating pumps at a point above the outlets of sewers, and lifting enough water into the Illinois and Michigan canal to cause an inward current of clean water from the lake. In dry weather the river was slightly improved. The pumps were powerless against storm flows which pushed the water body of the river out into the lake, defiling it over large areas. The sewage water which was pumped into the canal flowed westward, reaching the Illinois river at a point above Joliet where the water level of the river was a few feet below the level of Lake Michigan.

The future welfare of Chicago rendered it imperative that some great enterprise be undertaken for the protection of the city's water supply and, incidentally, of the public health. That which might have been done furnishes an interesting subject for speculation. Cities considerably larger than Chicago purify all their sewage by various processes, or filter their water, or both. Everyone knows what was done. It was decided to excavate a canal connecting Lake Michigan with the head waters of the Illinois river. This canal is to be capacious enough to permit the flow, not only of the city's sewage, but also of a large volume of lake water.

A few miles west of Chicago the Des Plaines river, reaching that point from the north, bends to the west and runs to Joliet. Thence southward the stream is known as the Illinois river. The descending grade in the channel, which follows the general course of the Des Plaines, is very small the first forty miles. The descent from Joliet to Utica, a distance of sixty miles, is about two feet to the mile. In the entire remaining channel of the Illinois, 240 miles in length, the fall is thirty feet, about an inch to the mile. In the course of the river are many basins favorable to sedimentation.

There is no precedent for such a work by a city of the first class. The city of Berlin employs its sewage for irrigation and purifies it by absorption through land. Paris is introducing the same system. The London sewage is moved a distance of twelve miles, is partially purified, and cast into the sea at ebb tide. There is really no short cut by which escape from measures forced upon older countries, for the conservation of public health, can be regarded as permanently possible in America.

Nor is there any precedent for such disposal in America. A strong current washes the frontage of New York and Brooklyn, carrying the water body, not in the direction of inhabited districts, but out toward the open sea. The Boston sewage is conducted to Deer Island Light, a distance of eight miles, and delivered into the open sea.

More apt parallels, in a sanitary sense, may easily be constructed by the imagination as, for example, in supposing the sewage of Berlin carried to the head waters of the Elbe; or that of London conducted northwardly through England and Scotland to the sea; or that of Paris delivered into some tributary of the Rhone; or that of New York carried

northward through several streams and states to the St. Lawrence. If these modes of disposal were physically possible the objections to them, from the sanitary standpoint, would be no greater than such as characterize the Chicago project; certainly there is no precedent or decision giving legal sanction for cutting through a natural barrier in order to send a city's sewage outside of its own natural basin.

The proportions in which the Chicago sewage may become a disturbing element by its precipitation upon these inland streams can be inferred by a comparison of populations. Chicago has to-day nearly as many people as all the cities on the rivers having over 100,000 population. The latter are, Pittsburg, 238,617; Allegheny, 105,287; Cincinnati, 296,908; Indianapolis, 105,436; Louisville, 161,129; St. Paul, 133,156; Minneapolis, 164,738; Omaha, 140,452; Kansas City, Mo., 132,716; St. Louis, 451,770, making in all, 1,930,439.

The aggregate of the sewered cities would certainly comprise all having populations of more than 25,000. In the census list we find these to be, in addition to the above, in a descending scale, headed by Columbus, Ohio, 88,150, as follows: Nashville, 76,168; Memphis, 64,495; Dayton, 61,220; Lincoln, 55,154; St. Joseph, 52,324; Evansville, 50,756; Des Moines, 50,093; Peoria, 41,024; Kansas City, Kans., 38,316; Sioux City, 37,806; Covington, 37,371; Wheeling, 34,522; Youngstown, 33,120; Springfield, 31,895; Quincy, 31,494; Topeka, 31,007; Dubuque, 30,311; Terre Haute, 30,217; Chattanooga, 29,100; Davenport, 26,872; Canton, 26,189; Little Rock, 25,874; La Crosse, 25,090. In 1890 the whole of these river populations aggregated 2,995,777. That census fixed the population of Chicago at 1,099,850.

If the dilution-cure of sewage water possessed validity the delivery of the drainage effluents of many of these cities, separated, as they are, by stretches of hundreds of miles, would be largely shorn of its responsibility. That which dilution accomplished for Chicago's partially purified sewage, at a distance of more than thirty miles, is thus referred to by the *Sanitary News* of July 19, 1890: "It would repay this congress to go and look at the stream that tumbles over the dam at Joliet. It is a sight for a water-supply man to remember all his life long. It looks much like a torrent of oil and ink, and in odor forcibly reminds one of the memorable couplet on Europe's famed City of Scents:

"The River Rhine doth, indeed, wash the city of Cologne; but who, in turn, shall wash the River Rhine!"

The dilution Munchausen once frequented the banks of the Ohio. Of late years he has dropped our valley from his itinerary, and it is generally understood that he has gone West. Certainly it is reasonable to suppose that a few germs are less likely to obtain a foothold than a great many. Certainly a lightly dosed water is less dangerous than one that is heavily dosed. If the chances of escape are in the proportion of 5,000 to one it may satisfy some people. On the other hand, if the contamination reaches a medium propitious to it there may be 1,100 fever patients and

110 deaths, all derived from one case, as at Plymouth. If dilution enables 5,000 to escape, leaving only one unhappy victim in whose Peyer's patches the virulent organism may form a new nidus for the propagation and dissemination of its frightful capabilities, ought not such dilution as that to be everlastingly condemned?

The several states of our national Union constitute one family; and family government is not without its perplexities. All the children do not take to education with equal kindness. The big bullies boss it over the weak. But that healthful growth which assures future well-being demands the adoption and enforcement of salutary restrictions for all, and equally for the benefit of all. Uncontrolled lawlessness and heedlessness bring disaster.

The fever-plagued cities of Western Pennsylvania should change their methods. The report of the joint commission of the cities of Pittsburgh and Allegheny exposes their sad condition, their unwholesome practices. They drink their own sewage. They have made an open sewer of the Ohio river. They should purify their sewer streams and filter their drinking water. The same course should be pursued by the sewered cities of West Virginia and Ohio, and Kentucky, and Indiana, and Illinois, and Minnesota, Wisconsin, Iowa, Nebraska, and Missouri. Think of the damage done by waste of fertilizers, and of the incomparably greater damage to physical well-being. It is wrong to convert the Mississippi into an open sewer. It is rational to hope and believe that these inland streams will be reclaimed and protected from pollution by the strong hand of government power.

But now, while boards of health are seeking remedies from these very ills, already grown potent enough to call for constant vigilance against their encroachments, we see this menace from the great city on the lake. The added pollution caused by the wastes of more than a million of people is to be thrown upon these waters; upon communities and interests that have had no part nor lot in its production, and which were protected against it by a natural barrier which it is costing more than a score of millions to remove. There is nowhere any record of a crime against health that can equal this in flagrancy. It is wholly out of harmony with the enlightened spirit and the best engineering practice of this age.

The instigating cause, an effort to obtain pure water, cannot be too highly commended. That concerns the municipality. Other cities, having already many difficulties to cope with, also desire water improvement. By way of palliation the river cities were assured that the dilution of the sewage in lake water would be a sufficient remedy. This claim had in certain seasons of the year, a seeming justification by the conduct of the greatly diluted sewage lifted from the Chicago river by the Bridgeport pumps. That sewage, very small in amount comparatively, had been cleaned of its heavier contents by primary sedimentation. The new drainage canal is planned to receive the crude sewage effluent. The tougher and grosser parts, buoyed up for a time by the ferments of

decomposition, especially in the periods of warmer temperature, will float, and hug the shore, very much to the latter's disadvantage.

The effect of other inevitable processes, additional to dilution, deserves consideration. The reports of the Mississippi River Commission, created by act of congress, June 28, 1879, sufficiently indicate the importance of sedimentation as a factor, and as a feature of running streams. Following putrefactive changes the solids, during dry times and a sluggish flow, settle to the bottom of the upper stream, somewhat to the advantage of those below. High water scours out and carries the sewage mud downward to the relief of those above. In this manner the accumulations of a number of months would be swept downward into the Mississippi in a few days. It would be interesting to know how far down stream a water supply should be located in order to be free from contamination under such conditions.

The objections to sewage water, under specific conditions, shrink somewhat with lapse of time. Pathogenic, water-borne organisms are much shorter lived in sunlight than in the dark. Nitrifying agencies act effectively when the exposed water surfaces afford a plentiful supply of oxygen. If sewage is immersed in water at a low temperature, and occluded by ice from solar and atmospheric modification, its capacity for mischief remains indefinitely unchanged.

The scope of this review does not comprise mention of the technical engineering features of drainage enterprises. The relations of sewer effluents to health, and to public control, only, are under consideration. It seems that the people on the Illinois river were awake alike to their danger, and to the rights and wrongs of the case. Five and six years ago meetings were held in several of the cities. In these meetings the cities of Peoria, La Salle, Morris, Ottawa, Peru, Lockport, Seneca, Marseilles, and Joliet were fully represented. The drainage scheme was denounced by pointed resolutions. Legal measures were instituted and carried through to a decision of the state supreme court. Another committee, consisting of the mayors of the several cities, endeavored to prevent legislative sanction of the enabling acts. Their efforts were without avail. Chicago was too powerful. But the United States is more powerful than Chicago.

The laws of the several states would afford all needed protection if they were enforced. Chapter 38, paragraph 277, of the criminal code of Illinois reads as follows: "It is a public nuisance to throw or deposit offal or other offensive matter in any water course, lake, pond, etc., . . . to corrupt or render unwholesome or impure the water of any spring, river, stream, pond, or lake, to the injury or prejudice of others."

Paragraph 278. "Every such nuisance, when a conviction therefor is had in a court of record, may be abated by the sheriff or other proper officer, and it shall be no defence to any proceeding under this section that the nuisance is erected or continued by virtue or permission of any law of this state."

The language of the Ohio statute is about the same, and its provisions are the same.

The statutes of all the states contain similar provisions. These fundamental laws embody man's innate sense of justice. The language of the federal law concerning the navigable waters under governmental jurisdiction is equally explicit, as witness the following, copied from section 6 of the River and Harbor Act of the United States, Sept. 19, 1890:

"It shall not be lawful to throw, or empty, or suffer to be done, any filth, refuse, or other waste of any kind into any port, harbor, navigable river, which shall tend to impede or obstruct navigation; or to deposit any filth or other waste in any place on the bank, where the same shall be liable to be washed into such navigable waters."

The text-books are equally explicit. Lewis, on "Eminent Domain," pages 65 and 86, has the following:

"The general right to the flow of a stream in its natural purity is fully established by the decisions. A company supplying a city with water cannot take the water of a stream and return an equal amount of inferior quality to the damage of the lower proprietors."

"There is no principle which allows a city to conduct into a stream, by means of sewers, the water and filth which comes from a dense population."

"There is no riparian right, even to cities on its banks, to cast filth into a stream.

"One proprietor upon a small stream would not be permitted to place his privy over a stream, or turn into it the refuse from his kitchen and stable; no more can a hundred proprietors of a large stream, or the corporate authorities of a city through which it runs."

Angell on Water Courses, paragraph 545, says:

"A municipality has no more right at common law to pollute streams with sewage than a private person, and its duty to prevent public nuisances by taking care of the sewage gives it no right to create another nuisance by the pollution of a stream."

Wood on Water Courses, paragraph 546, says:

"Even if sewage has been discharged into a stream for several years, but in quantities not producing perceptible injury, it confers no right to afterwards increase it so as to cause serious injury."

Addison on Torts, paragaph 1,049, edition of 1876, says:

"Boards have no power to collect sewage and pour it into a stream which was previously pure, so as to create a nuisance, or deteriorate the value of the land adjoining the stream * * * cities are not entitled to foul the rivers with the contents of water-closets and convert a stream into a stinking sewer."

Even the state reports of supreme court decisions interpreting law have, until within recent years, left no cause of complaint. An example is the following, by the supreme court of Illinois, in the city of Jacksonville v. Lambert, vol. 62, page 519. It says: "No one would suppose that a

city had the right, by drainage and sewerage, to collect dirty water, swill, putrid matter, and garbage of the city, or any portion thereof, and discharge it in the door-yards of a portion of the inhabitants. That would be a violation of every rule of law, and shock the sense of justice entertained by every fair-minded man." But I would not have room for a tithe of similar decisions that could be adduced.

Everyone knows that in this matter the fish industry of all the Mississippi system of rivers is seriously menaced, and the laws are by no means silent on this feature of the case. In the 111th Illinois Reports, page 581, the supreme court held: "No one has a right to wantonly destroy fish. The preservation of fish is a matter of public concern. If the fish in the streams are destroyed, the production of food will be decreased millions of dollars annually. The fish are the heritage of the poor. The legislature has no right to barter or grant away this right."

That which is in store for the Illinois tributary to the Mississippi, in respect to fish culture, may be apprehended from the following, copied from the Laws of Illinois, 1881, page 1593, where the legislature declared "that the sewage of Chicago annually caused the death of millions of fish in the Des Plaines and Illinois rivers; that the sewage in these rivers is a putrid mass, rendering the air impure and offensive, carrying with it the germs of disease, causing blood poisoning and illness in the valleys, and debilitating 200,000 people; that there has been a great loss of property and business on account of the sewage."

All the sewage which reached the waters above named at the time designated was pumped from the Chicago river at Bridgeport. It had been partially cleansed by sedimentation, and in quantity was less than a sixth of the amount that will go into these waters through the proposed drainage canal. The destruction of the fish was made especially obvious during winter time at the first Joliet dam. That being the point at which the vapors and odors got their first release during the period of ice, and of transmission of sewage for a distance of over thirty miles without any perceptible change of character, the vicinage, as already intimated, became almost unendurable to near-by residents.

Notwithstanding the very much greater dilution given to the sewage effluents of Pittsburgh and Allegheny, the phenomena at the dam thirteen miles below those cities on the Ohio river during ice periods are very similar to those just referred to. The species of fish that are fitted to maintain an existence in such media do survive, but they are undesirable and unmarketable. Along with the game fish many of the other graceful concomitants that were once the pride of dwellers on the Ohio have also taken their departure. The Ohio was the red man's "beautiful river;" it is the white man's sewage drain.

The sewers of Pittsburgh have a very wicked partner—the garbage boats. What the latter lack in quantity they make up in quality. Sewage pollutes water; crude, undigested, rotten, diseased garbage doubly pollutes

it. I copy the following from page 13, Annual Report of the Pittsburgh Bureau of Health, which appeared about July 1, 1895:

"When the boat is full (of garbage) it is floated a short distance below the city, and its contents dumped into the river. This boat and the manner in which the material is disposed of, has been a source of annoyance to many of our citizens and a cause for many complaints; one of which has been presented to the national government at Washington, protesting against the depositing of garbage in the river."

Urged thereto by cash considerations certain mathematicians have worried themselves over calculations as to the exact distances at which the smile of purity would shine again from the face of a stream that has been ill with sewage. Perhaps these philanthropists would favor us with some equally reliable data on garbage. Given, a boat's cargo of the refuse of stables, of stale fruit, of tainted meat, of dead dogs and horses, dumped into the Ohio river three miles below Pittsburgh; also, given a velocity flow of two miles an hour: how far down the river would these substances be in a healthful state for introduction into the human stomach with the water at a temperature of 50 degrees, at 40 degrees, at 35 degrees? I will spare him further figuring, for everyone knows that with an icy guard the products of organized life go unchanged around the whole earth.

And yet cities below do drink this water summer and winter. It goes into their houses at Wellesville, Martin's Ferry, and Bridgeport, and Bellaire, and Wheeling, and Ironton, and Portsmouth, and Gallipolis, and Cincinnati, and Evansville, and Louisville, and Paducah, and onward into the great Father of Sewers. The nooks and eddies in the Ohio that were once the angler's joy are murky with pestilence. Strange forms and indescribable mud crawl into and over them and the *beggiota alba*, filthy fern of sewage-laden water, trails its portentous drapery over rank wastes of rottenness and decay.

The real father and owner of these waters is the people, and the people's duly constituted authorities should come to our help, and come quickly. Here and there communities are combatting the pollutors. To a certain extent the Ohio state board of health has been equipped for this work by a law of the legislature passed March 14, 1893, which reads as follows: "No city, village, corporation, or person shall introduce a public water-supply or system of sewerage, or change or extend any public water-supply or outlet of any system of sewerage now in use, unless the proposed source of such water-supply, or outlet of such sewerage system, shall have been submitted to, and received the approval of, the state board of health."

The average legislator is not a sanitarian. His study has been to get office. Years of vigilant effort must precede such laws. Other years are needed to secure ready acquiescence. The example of the government in permitting the pollution of its navigable waters to that extent paralyzes the efforts of boards of health.

The evils of stream pollution have frequently been brought to the

attention of this association. The special committee of the association in 1888 consisted of Charles Smart, S. W. Abbott, G. C. Ashmun, W. W. Daniels, and Edward Playter. The dangers and wrongfulness of river defilement were most forcibly depicted by this committee, which recommended the following resolution:

"*Resolved*, That it is the well-considered belief of this Association that it is an imperative necessity, especially in the more populous states, that state legislatures should give their boards of health that financial support which would enable them to act intelligently on all questions pertaining to the public water-supplies, and with power to preserve these waters from contamination by sewage or other injurious matters."

This committee also declared that river waters into which sewage had entered could not thereafter be regarded as a safe source of water-supply.

Consequent upon the enactment of the Ohio law above referred to, the free delivery of raw sewage effluents into interior streams has been largely suppressed. In the navigable rivers traversing several states, it goes unvexed to the gulf. The government should put a stop to the pollution of its rivers. When the Mississippi needed improvement in respect to navigation, and riparian protection from floods, the Mississippi River Commission was established. The National Maritime and Interstate Quarantine Law, passed by congress January 13, 1893, is comprehensive and mandatory. It is national in character and interstate in operation. Americans sleep secure from appalling explosions of cholera and yellow fever. But those are not all, nor the worst. Professor Vaughan said in a recent address: "Typhoid fever destroys more citizens of the United States every year than cholera has destroyed in the last fifty years. In the United States 40,000 die from it every year, and there are sick with it 400,000. This means a money loss to the community of $40,000,000 every year. Suppose some foreign foe would rob us every year of forty million dollars; we would be up in arms. There would no longer be any trouble with the surplus; we would expend it righting our wrongs. But what is our government doing to-day? While every other government has a national board of health, ours has none. Every shore has its light-houses; we spend millions of dollars for the study of meteorological conditions and the diseases of animals. The United States has spent more money in the investigation of hog cholera than it has in the study of any of the diseases which man is heir to."

The commerce and interests of the marine people are protected and fostered by the coast survey, by the fish commission, and by many other specific forms of exercised authority. See what has been done for England by the rivers' pollution commission, for Germany by the Imperial board of health. Read and compare the typhoid percentage of those countries with those of the Mississippi valley cities. Is it not high time that Uncle Sam instituted a rivers' pollution commission for the protection of his own children?

There is not room in this review to present more extended evidence of

river defilement. Attention has been mainly given to practices and projects affecting two of the eastern influents of the Mississippi. It cannot be doubted that the waters of the great river are seriously menaced on the north and west. Sewage purification is entirely feasible, and is a thoroughly established department of modern engineering. Every river of consequence on the Atlantic slope, between the Androscoggin and the Potomac, participates in its benefits. Purification of sewage effluents by irrigation is becoming the rule on the Pacific slope, where the paucity of rain-fall, and the economic value of moisture, furnish an added incentive.

It is true we have laws and legislatures and courts. The laws are good, but they are dead letters, just as much in legislatures and courts as elsewhere. It is not laws, but the disregard of them, that causes trouble. The Illinois cities organized, and expended their utmost efforts to keep the sewage of Chicago out of their valley; but they are to have it, all the same, and by legislative permission. A supreme court opinion, filed June, 1890, uses this language in regard to the drainage project: "It will cause a large flow of water from Lake Michigan through the proposed channel into the Des Plaines and Illinois rivers, for the purpose of diluting the sewage and rendering it innocuous to those living along the course of those streams."

Discouraging as is the perpetration of such abominable stuff by a supreme court, and disheartening as it must have been to those whose health and property interests were at stake, such acts should cause no surprise. This judge was honest. He was not a sanitary expert. He knew no better. Interested attorneys had plausibly preached the dilution formula for the production of innocuousness and he believed it. All who have the conservation of the public health at heart should reach out for government help. Congress ought to establish a commission composed of competent men and should equip the same with ample authority. Such a board would be sheltered from popular reprisals. It could elaborate plans for the disposal of these vexatious problems that would be in harmony with the best results of applied science, and with the terse old Anglo-Saxon maxim that "no man has a right to injure his neighbor."

RIVERS CONSERVANCY BOARDS.—FROM THE INTERNATIONAL STANDPOINT.

By PETER H. BRYCE, M. D., Toronto, Ontario.

In bringing this subject before the attention of the Association, I am well aware that I am dealing with a matter which has not the same or an equal interest for all the members of the Association; yet on the other hand, I assume that the comprehensive character of this Association is such as from its very nature makes it especially fitted to discuss this, as all other questions having an interstate and, still more, an international bearing. I have further been, and am still, very conscious of the many practical difficulties attaching to any scheme which may be proposed for dealing with such questions, and am not ignorant of views which have already been expressed as to the impossibility of any successful efforts being made in this direction. If, however, we view in retrospect the progress of the Association, if we recall results of the efforts made towards interstate and international co-operation in measures for dealing with outbreaks of contagious disease, and if we remember that we have had, and still have, active committees dealing with such questions as the pollution of streams and the protection of public water supplies, it must be apparent, that the natural outcome of such labors will be to make evident the possibility of giving a practical direction to the conclusions which are the results of such efforts. I hold as true the laureate's words :

> "Yet I doubt not through the ages one increasing purpose runs,
> And the thoughts of men are widened with the process of the suns."

In order, then, that we may clearly comprehend the practical importance of the subject, we must recognize the causes which are at work changing the character of our lakes and streams from one of original purity to that of waters receiving the excrementitious products of millions of people living upon the shores or living in floating habitations upon their ample waters.

From the census returns of the last three decades, I find the following as seen in the tables appended to this paper to be the ratio of increase of the population of the states bordering on the Great Lakes.

In a paper presented to the International Conference of Health Officers in 1891, I pointed out, textually and diagramatically, that the local pollution then at work in the lake-side cities, had been instrumental in definitely raising the death-rate from typhoid fever in every city where local pollution of the water supply was possible, either from its own sewage or from that of neighboring cities. When I further point out, that notably on the two chief international streams, the St. Clair and the Detroit rivers, and the Niagara river, the populations have on the two

banks, increased in twenty years as set forth in the appended tables, it must be apparent that the pollution of these streams must shortly, if it has not already, arrive at such a point, that disastrous results cannot under present methods be long averted.

With regard to most of the streams of the continent, whether state or interstate, it must be generally accepted that the danger line has long since been passed, and that many city and town populations are now face to face with problems which are demanding the most serious attention of all engaged in public health work, whether municipal, state, or national. Dealing with the cities of the two principal international rivers situated as they are along the greatest fresh-water highway of the world, it is apparent that with a commerce passing by them and in which they all play a more or less important part, they are destined to become still more important factors in creating for one another dangers to which it would be criminal to shut our eyes; and owing to their international character it must be obvious, that the part that any one city, on either side of the border, may play in the injury caused to a neighboring town or city will vary according to the accidental relation which its location may have to that of the other.

These are illustrated by the following examples:

At Port Huron and Sarnia, the current from the west side flows within a short distance close to the Canadian shore; the sewage of Walkerville pollutes the public supply of Windsor, and the sewage of Detroit and its garbage indicate their presence at times fifteen miles down stream at the intake of the Amherstburg water supply.

On the Niagara river the total sewage of Buffalo and the total dredgings of the harbor and docks, amounting to thousands of tons daily, are poured into a stream with a current at from three to seven miles an hour, from which in a total length of thirty-two miles, some six large towns take their public water supplies.

So far as the very imperfect returns of deaths from these municipalities on both sides of the border indicate, no very notable increase in the typhoid death rate is yet apparent, but the epidemic of Sarnia of 1882, the somewhat high typhoid death rate of Windsor, and the brief explosion of typhoid in Buffalo in 1894, all indicate that the danger is only temporarily averted by the accidental situation of some towns and the great dilution of sewage in the case of some others.

It may be of interest to measure comparatively this dilution. In examining the details of the great Chicago Sanitary Improvement Canal, I find that when used at its full capacity the canal will discharge 600,000 cubic feet per minute.

From a calculation based on the government engineer's reports as to the width, depth, and rate of flow of the Detroit river, at Detroit, I find that it has a discharge equal to not more than twenty-five times that of the great Chicago canal. Most of us are familiar with the prevalence of typhoid which existed in Chicago for years prior to 1892, and I am

informed that in several large areas of the city, such prevalence of typhoid has recently re-appeared owing to contamination of the water supply of that particular district. When it is remembered that the daily excrementitious products in sewage of a mixed population amount to 2.5 ounces of dried fæces and 40 ounces of urine and that in the year 1892 the daily consumption of water in Chicago was 353,500,000 gallons, we can in some degree appreciate the extent to which pollution may extend, even in these great bodies of water.

It seems therefore impossible to avoid the conclusion that, when in addition to the sewage proper these international streams are at times polluted by garbage deposited from scows and from dredgings regularly dumped therein as at Buffalo, such a criminal disregard for the lives and interests of the people of the towns is being shown that the time at which the toleration of such acts can no longer be overlooked, has already arrived, and that it is high time that the question as an international question were taken up by the federal authorities of the two nations and by the states and provinces immediately interested. The question is increased in importance by the fact that an inland marine so great as to have some 300 vessels, as barges, sailing vessels, steamers, and excursion boats with thousands of passengers daily passing through the Detroit river, adds an element of pollution, especially to the stream which, under present methods of disposal of the excreta therefrom, becomes permanent in character, and which under certain circumstances may be fraught with serious danger to public water supplies, as several years ago was illustrated by an outbreak of typhoid fever in Sault Ste. Marie, owing to a large number of vessels having an enforced anchorage at the mouth of the canal, in the vicinity of the intake of the water pipe of the town.

Without, however, further illustrating the situation or its needs, it remains for us to consider the possibility of having some scheme developed, which will deal in some systematic manner with the problem through the coöperation of the several authorities especially interested.

It is quite apparent that those cities situated by accident at the entrance of the several rivers, being themselves largely free from imme diate danger, are, in keeping with common experience, but little likely to trouble themselves seriously regarding the question. This is illustrated by the past action of both Detroit and Buffalo, and of Walkerville, all situated so as to obtain a water supply direct from the lakes. The necessity for action must therefore be made apparent to our several legislative bodies before any concerted action can become possible. All are aware of how Chicago has been able to convince the legislature of Illinois of the necessity for turning a stream of one twenty-fifth the volume of the Detroit river and polluted with the sewage of 2,000,000 people, into the inland waters of the state, at the same giving to the whole scheme the euphemistic title of "The Sanitary District of Chicago." It may be that the cities of the Mississippi valley will be willing to

receive this contribution of Chicago's substance for the sake of the promised addition of one foot to the average depth of the "Father of Waters;" but the fact illustrates how all governments are prone to delay action until too late to supply an adequate remedy for evils whether commercial or sanitary. That preventing the pollution of streams is difficult, is realized when we view the very inadequate remedies which have been applied to polluted streams in those countries of Europe, where the cities have large and dense populations. In England, however, much has been attempted and something done. As early as 1848, with cholera past and present in mind, stringent laws against the pollution of streams were passed. Again in the Royal Commission's Report of 1865, strong ground was taken as to the positive dangers from polluted water supplies; and in the consolidated Public Health Acts now in force, the following general and far-reaching provisions exist:

Nothing in the act compelling the disposal of sewage, shall authorize any sanitary authority to make use of or use any sewer or drain for the purpose of conveying sewage into any natural water course or stream. The procedure under this act is simplified and cheapened so that action against offending cities can be taken before the judge of any county court; and by the act of 1890, a per diem fine of £10 may be levied against any person or corporation for discharging chemical wash or other liquid which causes a nuisance or is injurious to the public health.

Whenever the order of the local government board requires extended sanitary improvements, time is given for completing the same, but any defaulting municipality is liable to a fine of £50 per diem, and where continued the court may order any person to carry its decision into effect at the expense of the defaulting person or corporation.

Sanitary authorities may coöperate to construct sewerage works; one authority may expropriate land for its own needs, and pay in whole or in part for works constructed for its own and its neighbor's advantage, and within its own corporate jurisdiction.

In Germany, the only other European country which has attempted to deal systematically with this question of pollution of streams, no general laws as yet exist; but attempts made by different towns and cities to pour their sewage into neighboring streams have been hitherto defeated by the Imperial government, the minister of public works still having the duty laid upon him of deciding on the merits of each particular case. A commission composed of prominent scientists has, however, reported on the whole subject, and legislation is likely shortly to follow.

What the city of Berlin with over 2,000,000 of population has been able to do, illustrates the views which are held by sanitarians in Germany, and what the character of all legislation on this subject must necessarily be.

Turning to our own continent, we find that attempts in some instances of a comprehensive character have been made to deal with the subject of pollution of streams. The situation, however, at present seems to be,

speaking generally, that in agricultural states little legislation on the subject has taken place; while in those with manufacturing interests largely developed, the competition of towns and the private interests of large manufacturing concerns have for an opposite reason prevented any effective legislation being passed.

So far as I have been able to gather, if we except four states or provinces, the most that has been done is to provide for the adoption of by-laws by municipalities, to prevent local nuisances.

In those states or provinces where state regulation of the pollution of streams exists, it is found amongst these that Massachusetts has approached the subject with her well-known thoroughness, and has given us a consolidated law, which is clear and fairly comprehensive. The first wise and broad provision is that no person shall pollute any water used for domestic purposes.

The state of Ohio has made a notable advance in the laws dealing with the subject, and while leaving power in the hands of individual municipalities to protect their own water supplies within ten miles from the point of intake, has also placed power in the hands of the state board of health, requiring that all proposed systems of public water supply and of sewerage shall be submitted to it for approval. The fines for infraction of the law, though heavy, have not that cumulative character which makes them in the English act so effective a deterrent.

By the legislation of 1895, the province of Ontario has placed upon its provincial board of health equally great powers without, however, making adequate provision for comprehensive preliminary investigations by an engineer attached to the board. The law in the other Canadian provinces is very similar to that of Ontario and will probably be found fairly effective for present needs.

From these illustrations it will be seen that a fair start has been made on this continent, whereby municipalities are brought in these matters under the operation of general statutory law; and we may, I think, safely leave the several state and provincial boards to work out in each case individual enactments based upon their several respective needs. The fact, however, that the larger streams are commonly state or international boundaries, and that they are those on which the larger cities and towns are situated, makes evident the fact that common views must be held as to needs, in order that concerted action be possible in the evolution of some such comprehensive scheme of coöperative work, as shall remedy the serious evils which prevail.

Either of two methods seems possible: First, an organization similar to that of the Sanitary Council of the Missisippi Valley, formed at the time of the great epidemic of yellow fever, which while not having, as I understand it, the power to enact laws, did practically make laws by each state board agreeing to carry out the resolutions agreed upon by the council. Second, national commissioners who would exercise jurisdiction over, first, all interstate waters of their respective countries, and second, by

conjoint action over all international waters. Such commissioners would naturally be charged with the consideration of all schemes, which, having both commercial and sanitary phases, would demand the fullest investigations, in order that the interests of both should be considered to the greatest extent possible.

On such commissions would, naturally, be represented those officers of the several states specially charged with health matters, and who, under state laws, have more or less powers in municipalities under state or provincial jurisdiction. I illustrate the situation by a single case. The Niagara river is some thirty-two miles in length and has situated along it a population approximating 400,000. More than 300,000 of these are at Buffalo, which municipality at present illustrates in practice the fable of "The Wolf and the Lamb." At the annual meeting of the Ontario Association of Medical Health Officers, one of the most skilful experts of water analysis in Buffalo and a highly respected member of this association, presented a paper on the "Pollution of the Niagara River." The paper was a remarkably clever and ingenious one, gravely concluding with the opinion that on a continent where city building is going on with such rapidity, the pollution of even great volumes of water becomes inevitable, and that therefore methods for artificially sterilizing and purifying public water supplies (perhaps excepting Buffalo with our Lake Erie to draw from) must inevitably be the only remedy in the near future. Now were it possible to have the problem presented by the Niagara river investigated and discussed in its several bearings by an international or interstate commission, it would, I believe, be found quite possible for the present and future needs of the several municipalities in the matter of pure water, to be adequately dealt with by coöperation, and that an apportionment of the cost of a common supply of uncontaminated lake water for all the municipalities along the river could easily be arrived at.

With the needs of such conservancy boards to deal with our international streams so apparent, I would urge the appointment by this association of a special committee to consider this question with a view to reporting upon the best means for giving practical shape to the views contained in this paper.

TABLE I.

Population of certain States situate on Lakes, for the years 1870, 1880, and 1890, with per cent. of increase for the two periods.

STATE.	POPULATION.	POPULATION.	POPULATION.
	1870	1880	1890
Wisconsin	1,054,670	1,315,497	1,868,880
Per cent. of increase 1870 to 1880, 24.73 per cent. Per cent. of increase 1880 to 1890, 28.23 per cent.			
	1870	1880	1890
Minnesota	439,706	780,773	1,301,826
Per cent. of increase 1870 to 1880, 77.57 per cent. Per cent. of increase 1880 to 1890, 66.74 per cent.			
	1870	1880	1890
Michigan	1,184,059	1,636,937	2,093,889
Per cent. of increase 1870 to 1880, 38.25 per cent. Per cent. of increase 1880 to 1890, 27.92 per cent.			
	1870	1880	1890
Ohio	2,665,260	3,198,062	3,672,316
Per cent. of increase 1870 to 1880, 19.99 per cent. Per cent. of increase 1880 to 1890, 14.83 per cent.			
	1870	1880	1890
Pennsylvania	3,521,951	4,282,891	5,258,014
Per cent. of increase 1870 to 1880, 21.61 per cent. Per cent. of increase 1880 to 1890, 22.77 per cent.			
	1870	1880	1890
New York	4,382,759	5,082,871	5,997,853
Per cent. of increase 1870 to 1880, 15.97 per cent. Per cent. of increase 1880 to 1890, 18.00 per cent.			
	1870	1880	1890
Illinois	2,539,891	3,077,871	3,826,351
Per cent. of increase 1870 to 1880, 21.18 per cent. Per cent. of increase 1880 to 1890, 24.32 per cent.			
	1870	1880	1890
Indiana	1,680,637	1,978,301	2,192,404
Per cent. of increase 1870 to 1880, 17.71 per cent. Per cent. of increase 1880 to 1890, 10.82 per cent.			

Population of Cities and Towns in United States on Great Lakes.

STATE OF WISCONSIN.

	1870	1880		1890	
Name.	Population.	Population.	Pr ct. increase.	Population.	Pr. ct. increase.
Kenosha	4,309	5,039	16.84 per cent.	6,532	29.63 per cent.
Racine	9,880	16,031	62.25 "	21,014	31.08 "
Milwaukee	71,444	115,587	61.78 "	204,468	76.90 "
PortWash'ngt'n	2,390	2,604	8.95 "	1,659	.....
Manitowac	5,168	6,367	23.20 "	7,710	21.09 "
Kewannee	.....	1,050	.....	1,216	15.81 "
Sheboygan	5,310	7,314	37.73 "	16,359	123.67 "
Sturgeon Bay	.....	2,049	.....	2,194	7.07 "
Two Rivers	1,365	2,052	50.33 "	2,870	39.86 "
Total	99,866	158,093	37.29 pr ct. ave.	264.022	43.14 pr ct. ave.

STATE OF MINNESOTA.

Duluth	3,131	838	.....	33,115	3,851.67 per ct.

STATE OF MICHIGAN.

Grand Haven	3,147	4,862	54.49 per cent.	5,023	3.31 per cent.
Muskegon	6,002	11,262	87.63 "	22,703	101.59 "
Ludington	.....	4,190	.....	7,577	80.36 "
Manistee	3,343	6,930	107.29 "	12,812	84.88 "
Alphena	.....	6,153	.....	11,283	83.37 "
Bay City	7,064	20,693	192.94 "	27,839	34 53 "
Monroe	5,086	4,930	.....	5,258	6.65 "
Buchanan	1,702	1,894	11.28 "	1,994	5.29 "
St. Joseph	.....	2,603	.....	3,733	43.41 "
South Haven	1,576	1,442	.....	1,924	33.42 "
Mount Clemens	1,768	3,057	72.91 "	4,748	55.31 "
Sault St. Marie	.....	1,947	.....	5,760	195.84 "
Benton Harbor	661	1,230	86.08 "	3,692	200.16 "
Sand Beach	.....	534	.....	1,043	95.31 "
Total	30,349	71,727	87.51 pr ct. ave.	115,389	73.10 pr ct. ave.

STATE OF OHIO.

Ashtabula	1,999	4,445	122.36 per cent.	8,338	87.58 per cent.
Sandusky	13,000	15,838	21.83 "	18,471	10.31 "
Cleveland	92,829	160,146	72.52 "	261,358	63.20 "
Toledo	31,584	50,137	58.74 "	81,434	62.42 "
Amherst Vill'ge	.....	1,542	.....	1,916	24.25 "
Painesville	3,728	3,841	3.03 "	4,755	23.79 "
Geneva	1,090	1,903	74.59 "	2,194	15.29 "
Total	144,230	237,852	58.84 pr ct. ave.	378,466	40.97 pr ct. ave.

STATE OF PENNSYLVANIA.

Erie City.....	19,646	27,737	41.18 per cent.	40,634	46.50 per cent.

STATE OF NEW YORK.

Rochester.....	62,386	89,366	43.25 per cent.	144,834	49.83 per cent.
Oswego.....	20,910	21,116	.98 "	21,969	3.88 "
Dunkirk.....	.....	7,248	.....	10,046	38.60 "
Watertown....	9,366	10,697	14.72 "	16,952	58.47 "
Total.....	92,662	128,427	19.65 pr ct. ave.	193,801	37.69 pr ct. ave.

STATE OF ILLINOIS.

Chicago.....	298,977	503,185	68.30 per cent.	1,099,850	118.58 per cent.

STATE OF INDIANA.

Michigan City..	3,985	7,366	84.84 per cent.	10,776	46.29 per cent.

TABLE II.

Cities and Towns on International Rivers.

STATE OF MICHIGAN.—ON RIVERS.

1870		1880		1890	
Name.	Population.	Population.	Pr ct. increase.	Population.	Pr ct. increase.
Fort Gratiot...	.....	1,280	.....	2,832	121.25 per cent.
Port Huron....	5,973	8,883	48.72 per cent.	13,543	52.46 "
Detroit.....	79,577	116,340	46.20 "	205,876	76.96 "
Total.....	85,550	126,503	47.46 pr ct. ave.	222,251	83.55 pr ct. ave.

STATE OF NEW YORK.—ON RIVERS.

Buffalo.....	117,714	155,134	31.79 per cent.	278,796	64.80 per cent.
Niagara Falls..	3,006	3,320	10.44 "	5,502	65.72 "
Suspension B'dg	.....	2,476	.....	4,405	77.91 "
Lewiston.....	770	680	.....	633	.....
Tonawanda....	3,039	4,909	61.53 "	7,145	45.55 "
Total.....	124,529	166,519	34.48 pr ct. ave.	296,471	63.49 pr ct. ave.

TABLE III.

Cities and Towns in Ontario on International Rivers.

	1870	1880		1890	
Name.	Population.	Population.	Pr ct. increase.	Population.	Pr. ct. increase.
Sarnia	2,929	3,874	32.26 per cent.	6,692	72.74 per cent.
Chatham	5,873	7,873	34.05 "	9,052	14.97 "
Windsor	4,253	6,561	54.26 "	10,322	57.47 "
Sandwich	1,160	1,143	.....	1,352	18.28 "
Fort Erie	835	722	.....	934	29.36 "
Amberstburg	1,936	2,672	38.02 "	2,279	.....
Total	16,986	22,845	39.64 pr ct. ave.	30,631	38.56 pr ct. ave.

TABLE IV.

Towns and Cities on Red River in United States.

STATE OF MINNESOTA.

	1880	1890	
Name.	Population.	Population.	Per cent. of increase.
Breckenridge	.....	655	.....
Caledonia	894	927	3.69 per cent.
Total	894	1,582	3.69 per cent.

NORTH DAKOTA.

Pembina	287	670	133.45 per cent.
Grand Forks	1,705	4,979	192.00 "
Fargo	2,693	5,664	110.32 "
Total	4,685	11,313	144.96 pr ct. ave. increase.

Towns and Cities on Red River in Manitoba.

Winnipeg	7,985	25,639	221.09 per cent.
Selkirk	.....	950	.....
St. Norbett	.....	960	.....
St. Boniface	1,283	1,553	21.04 per cent.
Total	9,268	29,102	121.06 pr ct. ave. increase.

DISCUSSION ON THE PAPERS OF DRS. HARTZELL AND BRYCE.

DR. ERNEST WENDE of Buffalo.—I wish simply to make a correction. The Association, I judge, from the remarks Dr. Bryce made, might think Buffalo dumped her garbage into the Niagara river. That is not the case. Buffalo cremates her garbage. The difficulty that arose between the Canadian government and some of the garbage contractors of Buffalo was because they dumped earth into the river. It was not refuse. This was dumped below the inlet of the Buffalo water supply. I approve of the action of the Canadian government, but I simply want to state that Buffalo does not dump its garbage into the river, but cremates it.

DR. A. W. CANTWELL, of Davenport, Ia.—Living on the Mississippi river and being a member of this Association for many years, I do not think I have ever heard two papers more valuable than those which have been presented this morning. Go where we will in this country, we will find more or less pollution of our streams, and this is a subject that will come before us from time to time and we must deal with it. I do not know of any better way to approach this subject than from the standpoint of trying to secure national legislation for the purification of our rivers and streams. In my city we use the river more or less as a sewer, and we dump into it from ten to twenty tons of garbage every day. It costs but little to do this. To cremate the garbage would cost us something, and that is one reason why we dump it into the river. I believe reference was made to the pollution of the Mississippi river in the last forty years, showing that forty years ago from St. Louis up there were only a few thousand people, but the population of the cities along this river has increased to a surprising extent, so that the river is now being polluted more or less by nearly a million and a half of people. What will it be in future years unless something is done? This Association will have to stop the pollution of streams, and sewage from going into the rivers, by legislation. I hope the Association will see fit to appoint a committee in order that something may be done.

DR. E. A. GUILBERT, of Dubuque, Ia.—I have been deeply interested in these papers, particularly in the one of Dr. Hartzell of Ohio. I deeply appreciate the importance of action on the part of this Association. Of course, it will be entirely tentative, but it will have its effect. The gentlemen here seem to forget that this matter is already before congress. Last winter a congressman from Indiana, whose name I regret to say I cannot recall at this moment, introduced a short but exceedingly concise and expressive bill in the house of representatives, which is now in the hands of a committee. It was introduced late in the session. Our state board of health, at its quarterly meeting in February, had this matter before them, and, feeling the necessity of action on our part, as well as on the part of other state boards, we introduced and passed a series of resolutions commending the bill, and ordered them transmitted to our represen-

tatives and senators in congress, who were importuned to give the bill all the aid they possibly could. Some of these men have been heard from. Some of our representatives there are men of calibre, who have considerable back-bone; men who understand this matter thoroughly and have the courage of their convictions. I have conversed with several of them, and I think at the next session of congress something may be done in that respect, unless the near approach of the presidential election shall so absorb all efforts that everything else will go by default. It is highly important that this Association should take not only formal, but positive, action in this matter, and endeavor to influence our representatives in Washington to see whether some legislation cannot be effected which will stop the pollution of our streams. It cannot be done by state legislation alone. This bill requires the appointment, as I understand it, of a Mississippi river commission, and this commission is to have power to determine what shall be done with reference to prohibiting the pollution of water supplies and to recommend to congress such action as is necessary. And they are endowed to a certain extent with judicial power. I do not recall the essential features of the bill at this time.

Dr. P. H. Bailhache, of New York.—I desire to inquire whether the bill referred to passed. If not, a bill pending before the last congress is dead, and, if we desire to accomplish anything in the way of legislation, it will be necessary to re-introduce that or a similar bill in order to have action taken. Any bill that was before the last congress will never come up again unless it is re-introduced.

Dr. Guilbert.—My understanding is that the bill is still in the hands of the committee, but has not been reported on.

Dr. James Patterson, of Winnipeg.—I desire to express my approval of the papers read. I think the only way to dispose of the matter to which Dr. Bryce refers is by the appointment of an international commission. The Canadian government will have to take part in it the same as the United States government. I wish to refer to one river that has not been touched upon, namely the Red river running to the north. It runs through to Minnesota, or is the dividing line between Minnesota and Dakota, the principal source of water supply we have in these two states, and it is polluted to a serious extent by the sewage, garbage, and refuse from the towns and cities in the states of Dakota, Minnesota, and the north. I hope that if a committee is appointed to take this matter into consideration it will not forget the condition of the Red river to the north.

Dr. Joseph J. Kinyoun, of Washington, D. C.—I heartily endorse the papers presented this morning on the subject of pollution of our water supplies. There are about twenty-five million people directly affected by the pollution of the rivers of the United States. It has become one of the greatest and most serious questions with which we have to deal. It is far more important to us than cholera, yellow fever, small-pox, or plague. Congress has been importuned several times

during the past to take some action with regard to the local effect of these infectious diseases, which we are supposed always to get largely from foreign shores, and during the last congress, through committees of both houses, an emergency fund of $687,000 was set aside to be used only in the presence of a direful epidemic. Now, it seems to me a part of this fund could be used for the investigation of such questions as are now occupying our attention, among which is the question of the pollution of water supplies. Mr. Barthold, a member of the inter-state committee of the house, who is probably as much interested in the subject of the great drainage canal as any one, had several conferences with the Marine Hospital Bureau with regard to the proper action to be taken. He is thoroughly in sympathy with the appointing of a commission to carry out this work, and he feels that there are more concerned in the matter than those residing along the banks of the Mississippi river. The subject should be thoroughly investigated and taken up along the broadest lines possible with the effort of bringing about the greatest good. It is my belief that some such commission, acting under the central governmental authority, should be appointed, and the men composing that commission should be selected by reason of their peculiar fitness for such work, and that the investigation should be undertaken on governmental or provincial lines. The subject of pollution of water supplies of the United States is unique and stands alone. The conditions we have here are entirely different from those that exist in other countries, and, we could not, even by the most careful scrutiny and study of those conditions that exist in Europe, draw an apt lesson therefrom. It is my belief that a commission should be appointed of sufficient size, not too large, which shall comprise the best men of the country ; give them ample funds to meet all requirements, and not be contented until they are able to present to the American people a comprehensive report on the pollution of water supplies, the best methods for the prevention of the same, and make such suggestions to individual states that they can take intelligent action and bring about a better condition of our health than now exists. As years go along, the question becomes more and more important, and the sooner such action is taken, the better it will be for the general public.

Dr. Felix Formento, of New Orleans.—I am sure I voice the sentiments of the members of our Association, when I say that we have all listened with great satisfaction to the reading of the papers on this very important subject, the pollution of streams. It is a subject of as great importance as any which occupies our interest and attention. We all agree as to the necessity of doing something. We are all interested as sanitarians with reference to the manner in which our water supplies shall be purified. I represent that part of the country situated at the lower end of the Mississippi. I sometimes wonder whether the pollution of the streams of the upper Mississippi and Missouri rivers can have any influence upon the pollution of our river in New Orleans. To think so,

it would be necessary to believe in homeopathic dilution. I do not think that at such a distance a river can be polluted to any extent. But we are to look upon this problem from a general sanitary point of view. Something must be done. The gentlemen have spoken of the conditions as they exist, and recommend that some action emanate from this society which represents the sanitary officers and sanitarians of the whole country, and transmit the same to congress, recommending that such an international commission be appointed as has been spoken of. Although in favor of bringing about such measures, I was very much afraid it might not amount to anything. These Platonic recommendations are not looked upon with the careful consideration they deserve, and some action should be taken now to remove the evils which have been pointed out so vividly by the first speaker. The Chicago drainage canal, which is being dug at the present time, would require some action at this moment, in order to prevent the wholesale pollution of the Mississippi river by this canal. Something must be done. What is to be done? I am not prepared to say. I would like to discuss the necessity as to what is to be done, so that we can accomplish more than a mere expression of opinion. The latter does not amount to anything, unless we devise some practical means of stopping the nuisance which is going on from day to day, and which is not limited to the Mississippi river, but to the whole country. Streams are being polluted by garbage everywhere or by refuse, etc. We need remedies for these evils. Can we apply them, or will they be enforced? Cremation is one; purification of sewage, such as is practised in European cities, is another. The committee that is appointed to study this question should come before us with a practical plan, by means of which we will be able to accomplish something beyond the simple expression of opinion.

Dr. R. H. Lewis, of Raleigh, N. C.—After listening to the remarks of the preceding speaker, in reference to this matter of pollution of water supplies, it occurs to me that we have in view the protection of the water supply for other cities below the river referred to. There are several cities and states involved, and we must, therefore, if possible, concentrate some influence in order to offset any opposition that may be raised from any particular city or state. So it occurred to me that perhaps it would be well for a committee to take the matter in hand to secure legislation from congress, and in the appointment of this committee it should be composed of representative members of the different state boards of health on the rivers that are involved. Personally, our state is not interested in this. The health officers are united, it seems to me, and I think it is the best method we can adopt, in order to influence congress to take the necessary action.

Dr. J. N. McCormack, of Bowling Green, Ky.—In accordance with the suggestions of Dr. Bryce, I move that a committee of three (with Dr. Bryce as chairman) be appointed to bring this matter in more suitable form before the Association. Seconded.

THE PRESIDENT.—I am inclined to think that this resolution should go before the executive committee, but the Association can vote on it if they so desire. (The president put the motion, which was carried).

DR. E. P. COOK, of Mendoto, Illinois.—I ask your indulgence for a few moments. I rise with some degree of reluctance to speak in the presence of such a distinguished body of sanitarians, but entertaining some views out of harmony with the prevailing sentiment of the Association, I will take this position: We all understand that the water courses and the sources of water supplies of humanity have long been considered sacred, and at this latter day there is no subject more worthy of our consideration than the water supply of these growing communities, scattered all over our country and that of our neighbors contiguous. Unquestionably Nature intended that these water courses should be for the conveyance of the storm water, although the time has come when man's necessities have compelled him to use that water supply for his good. To-day I think we are reaching the stage in which the great thought should be purity of water for domestic purposes and absolutely clean water for drinking purposes. It seems to me, it is utterly impossible, and will increasingly become more difficult to secure pure water for domestic and drinking purposes without the adoption of methods of filtration, and perhaps sterilization afterward. The office of these great water courses is to meet a commercial necessity. It is a business one. And let me say further, it occurs to me that this great Mississippi is to be the future *cloaca maxima* of the Mississippi Valley, and that other streams intersecting it will be more or less affected. My home is in the interior of Illinois, a city in which the population is rapidly increasing, in one of the agricultural districts, with five thousand inhabitants. The question before us to-day is, what disposition shall we make of our garbage and sewage? It is no longer a question as to the necessity of cremation everywhere to dispose of garbage and rubbish. Let that be settled. As to sewage, however, we meet a difficult question. Contamination is inevitable if it is conducted into these streams. Sooner or later there will be danger possibly at the outlet of the Mississippi at New Orleans; but, as Dr. Formento has said, the stream may be so diluted or rid of pollution that it is harmless. But it occurs to me that the financial question will come into consideration after a while, and that we can more inexpensively and successfully dispose of our sewage by conducting it into these water courses and seek our water supply for domestic and drinking purposes from other sources. Chicago has been menaced with contamination of water supply because of what she is, and she will be able to seek her water supply from other sources. The water may be conducted by means of filtration beds, may be sterilized and rendered innocuous at not great expense; but the excreta, great waste, must be disposed of near the city of Chicago. It must be conducted by our water courses to the sea. Her nearest course is through her drainage canal, the Illinois and the Mississippi rivers.

I certainly should not have asked your indulgence in presenting these

views, out of harmony with those entertained by most of the members of this Association, if I did not believe there was a growing sentiment that we will ultimately establish in this western portion of our country and in the great Mississippi Valley means whereby this matter of the pollution of our streams will be considered from that standpoint. Our friends upon the lakes should be under great obligations to the city of Chicago and state of Illinois if she will conduct her sewage in a different direction.

Mr. Rudolph Hering, of New York city.—As a civil engineer, I would like to make a few statements on the subject under discussion. In the first place, I would say I am fully in sympathy with the sentiments contained in the two papers with regard to bringing about purity of our water supplies, and no one can be more in sympathy with such a movement than a civil engineer who is called upon to provide water supplies. I also wish to state how much in sympathy the profession of civil engineers would be with any movement on the part of this Association to have some national legislation effected on the subject of pollution of rivers. We all know what a tremendous effort was necessary to accomplish it in England, how it failed in Germany at first, but they are accomplishing in Germany now by efficient legislation a good deal, but not as much as they sought for at first. The question is a very important and serious one, and the engineer, you might say, is practically the doctor in such cases. He is called upon by the cities to help to advise what to do in order to get the best water and to prevent sewage pollution, and usually he has finally to deal with the subject. I am sorry to say that I cannot fully endorse all the sentiments contained in the two papers, particularly in the first one, because some of them are impracticable. There are two questions which it is necessary for us to consider. The first is the sanitary one, and the second, the financial one, and it is just as important, so far as practical results are concerned. Take a poor person suffering with consumption in the East. If he wants relief, he is told by a physician to go to Colorado or some other place where he is likely to entirely get rid of his disease, or he is relieved for many years. The patient says, "I cannot do it; I have not the money." You have to do the best thing you can without money. And that is the question the engineer has to face. He is placed in the same condition as the patient. People cannot pay for a complete purification of sewage, or cannot pay for complete purification of their drinking water, and the question is, what can you recommend us to do, so that we can get water that is better than we have now? The engineer wants to give the people as pure water as possible. He wants to make sewage innocuous, or to destroy it. But he cannot do it because no one has the money to pay for it. As chief engineer of the Chicago Commission and the one who recommended the plan against which so much has been said to-day, I would like to say a few words. The question is not nearly so bad as it has been represented here this morning. I was engaged for eighteen months with others in close study as to what Chicago should do to maintain purity of water supply and to get rid

of sewage, as the city wanted provision made for two million and a half of population. Everything that we could possibly find in Europe and America was discussed; experiences were collected and carefully weighed; the best methods of purification considered, and estimates of cost were made and carefully examined as to how to purify sewage in the manner recently brought to our notice by the Massachusetts State Board of Health, and it was found that Chicago would have to pay sixty-five millions of dollars to accomplish purification of its sewage in that manner. Another method was carefully examined, and that is the precipitation by chemical means. I have no doubt that most of you saw the splendid manner in which this method of disposing of sewage was demonstrated at the World's Fair, and is now practised in Massachusetts and in other places in this country, as well as a large number of places in England. This method would cost Chicago nearly seventy millions of dollars, and the results would not be so satisfactory as many would suppose. For instance, careful examinations in Chicago at the World's Fair by that process, carried on under the very careful personal supervision of Mr. Hazen, a member of this Association, showed that it was not possible to remove more than about one half of the organic matter from the sewage, the rest went into the lake. You cannot, under any circumstances, in this country precipitate by chemical means sewage for less than perhaps thirty cents for every man, woman, and child per annum. See what that amounts to for a city! Where is its practicability? The engineers are compelled to put sewage into rivers as long as it is not objected to and does not do harm, and it must be done until we have more money to do something better with it.

In regard to the Chicago drainage canal, I wish to say a word or two more. It was necessary, because it amounted to so much money, to find out how large a canal should be made to carry the water which was properly diluted. Calculations were therefore made and investigations carried on in this country and in Europe, and it was found that if we diluted the sewage of one thousand people with two hundred and fifty cubic feet of water, taking up sewage every minute of time, we would get conditions which would not be objectionable to anybody. The information was obtained in this way: Take the river Oder. It was there that a portion of the river was examined which showed very little pollution from the city of Breslau; it was found how much water flowed and how many people discharged sewage into it. The same thing was done with the river Elbe, and with three or four other rivers in English towns, and also in our own country. Let us take the Des Plaines river of Illinois, into which the sewage of Chicago is now poured. We find that the people of the city of Peoria and its vicinity until a few years ago used the water for drinking purposes. It was not objectionable to the people living alongside of it. It is not to be expected that with a river anything like the present Chicago river, the people will use the water for drinking purposes. The water supply for drinking purposes should be filtered and made absolutely pure. Personally, I am in favor of that and all engineers are coming to it

Europe has already taken that view. In England and Germany, all water supplies from rivers, even though not polluted, must be filtered for drinking purposes. Take the water in Switzerland. There are beautiful lakes there containing no sewage, and yet the water is filtered in an excellent way before it is used for supply purposes. We must strive to get pure water supplies obtained by filtration or other purification methods. Our large rivers can be used for such pollution which it is impracticable to keep out, and which should not be sufficient to make the stream offensive. A great deal of wash water must necessarily go into these rivers and you cannot purify the streams; but we should, at all hazards, purify our water supplies for consumption. Let the general dust and refuse, which cannot be kept out, go into the large rivers, provided it does not cause a nuisance. Garbage should never be thrown into streams that can reasonably be kept out, and it is to be expected that cities in the future will pay enough to keep it out of every stream.

Dr. C. O. Probst, Columbus, Ohio.—It has been suggested by the previous speakers that the committee to be appointed should bring the matter of pollution of our water supplies before our national governments with a view to securing legislation, and possible appropriations, for carrying on such work as would have to be done. It is to be doubted whether we are prepared to carry the matter this far at the present time. While we may be educated as to the extent of such pollution, and as to the evils arising from the use of such water supplies, the general public is not. A great deal of information in regard to such matters has already been gained in individual states, and I would suggest that this committee should endeavor to collect this and place it before the people. Any commission created by congress should also have the collection of information in regard to water-borne diseases made a prominent feature of its work. Let the people once be thoroughly convinced that the pollution of our rivers is causing hundreds and thousands of deaths, as is claimed by sanitary authorities, and they will be willing to bear the expense of properly caring for the sewage, garbage, and other filthy substances poured into them.

The farmers in Ohio are just learning that they have a right to the streams in their natural state of purity, and that the courts will sustain these rights. Several of our cities have recently been compelled to purify their sewage to escape damage suits for the pollution of streams. The people throughout our respective countries should be impressed with the idea that their united demand would enable a stop to be put to the abominable practice of turning our rivers into sewers. We should all work together in this important matter to secure the legislation we so much desire.

Dr. Bryce (closing the discussion).—We all fully recognize the position taken by Mr. Hering. I think his remarks illustrate exactly the absolute necessity for a commission of this kind, when he stated that he with many other prominent civil engineers in this country was engaged

for eighteen months in discussing the important matter of what should be done to best relieve one city of its own sewage. Now, if it took Mr. Hering and others this length of time to settle the question for this one city, it would seem only natural that a commission should be appointed with proper powers to consider this subject in all its aspects. The position seems to be made clear that we must have a committee appointed to consider this matter seriously, not for the benefit of one particular community, but for the salvation of all cities whose water supplies are being constantly polluted.

The other points that have been made are in the direction of the views expressed in the two papers, and a resolution has been unanimously passed that a committee be appointed to draw up resolutions or make a report, and I would suggest that when that committee is named by the president, a gentleman so well known as Mr. Hering should be appointed on it, so that his views and those of engineers shall receive proper consideration.

NOTES ON THE SOIL FACTOR IN THE DEVELOPMENT AND PREVENTION OF INFECTIOUS DISEASES.[1]

By EDWARD PLAYTER, M. D., Ottawa, Canada.

In England, the health authorities in abolishing the quarantines practically recognize, in a measure, at least, the principle this paper is designed to advocate: that, namely, of taking into practical consideration in preventive medicine in a much greater measure than we do at present that important and essential factor in the development, growth, and spread of infectious diseases, which has been aptly termed soil;—the good soil, for that infecting seed which does not fall by the wayside nor upon rock. It is true that even in England the principle is not acted upon to that extent —that personal or individual extent—which it seems possible for us as sanitarians to attain. The importance in the development of specific disease, and of epidemics thereof, of the factor soil, is being gradually more and more recognized; but in all our efforts to prevent disease, it is yet kept quite in the background. True, in pamphlets distributed for preventing the spread of diphtheria, for example, the public are advised not to neglect a "sore throat," and in cholera pamphlets a few lines of instruction are added respecting the diet and general habits of life. Nevertheless, almost the whole of the instructions, like our preventive measures, bear on the destruction of the seed—the infection. The infection appears to be regarded as, and so the people are taught that it is, the one, the first and only cause of the disease which it is our object to prevent. Now are the specific germs the first or most important cause? Are they the immediate, exciting cause? If it be true, as now seems probable, if not almost certain, that the cholera bacilli or vibrios will not live or develop in a clean, healthy digestive canal; if it be true, as seems more than possible, that typhoid fever will not spring up in a clean, healthy intestine—one not in a condition like unto a well-filled heated privy vault which may transform the benign bacillus coli communis into a virulent pathogenic parasite; if the diphtheria bacillus will not infect a sound, healthy throat, and it is said it will not grow when implanted on the sound mucous membrane of a susceptible animal; and if the tubercle bacillus will not take root except in specially prepared soil—probably, as I hope to be able to show more clearly before many months, a soil specially prepared by defective respiration, then, are not the so-termed "predisposing" conditions of the body—of the intestinal canal, of the throat, and of the tissues invaded and colonized by the bacillus tuberculosis, respectively, in the diseases above named, with probably in all cases weakened phagocytes, or power of resistance against the invading

[1] Presented at the Denver meeting.

infections, then are not these conditions, rather than the disease germs, the immediate, exciting causes of the respective diseases?

The germs of typhoid fever, diphtheria, and consumption are ubiquitous in most countries, countless billions of them being cast off daily by the diseased. With the majority of persons they are harmless. Those persons therefore who furnish the soil for the growth of the germs, and so for the development and spread of the diseases, furnish there and then the immediate, exciting cause of them, the most important of the two chief causes in all infectious diseases.

It appears to be becoming clearer and clearer that some of the so-called pathogenic organisms are first, if not always, saprophytic;—simply scavengers, in accordance with nature's universal law, as well exemplified in the common house fly which frequents, with numerous companions, the kitchen in and about which there is exposed decomposing refuse. It is not probable, not in accordance with nature, that these microscopic organisms were ever designed for the destruction of man. By his uncleanliness, man transforms them or their products into virulent poisons; a process, explainable on principles familiar to the cultivators of plants.

Eighteen years ago, Dr. Alfred Carpenter, the eminent English sanitarian, laid down the following rational hypothesis, respecting the development of infectious diseases.[1] He first remarked: I much doubt if these living organisms, the disease germs, could have any effect upon the body *if the recipient were perfectly healthy; if no impurity existed in the fluids of the body;* if the blood contained nothing foreign to a healthy and natural state. If this be so, he continues, a question arises, as from whence these impurities proceed, and how their effects are to be guarded against. I venture to put forth an hypothesis for consideration, which will explain much which is difficult to understand on any other view. Some impurities must exist; they are the used-up matter, the result of the act of life, or they may be inherited tendencies, which have resulted from former neglect of sanitary law, and which have depreciated the quality of the stock, and rendered it more susceptible to bad influences. The impurities naturally increase if there are any defects in the sanitary arrangement of the individual corpus. Their presence is of no moment if they are not in excess, and if they are removed from the body as fast as they are formed, or in the course which they naturally follow. Let us represent them by X, in an equation in which the factors X, Y, Z, (as a total) represent any form of epidemic disease. The problem is to assess the value of each factor in the equation. Divide the factors into two parts—centric elements, or those which are proper to the body; and eccentric, or those which act upon it from without; X, Y, Z, may equal zymotic disease of any kind. Let X=U and E; U being the used-up material, the formed material of Beale, always in the act of formation, is

[1]Canadian Health Journ Sept. 1876—Vol. II, p. 278.

not foreign matter, and is not in ordinary proportions injurious to life. It is always being diminished as fast as it is formed, by one or other of the excretory organs which exist for the purpose of removing it. If all the excretory organs, and all functions are healthy, and all doing their work properly, the body is in good health, there is no excess of used-up material, no *debris* of combustion. If, however, one or other of the excretory organs fails to do its duty, from either overwork or inertness, something is left in the humoral system, and E is added. It becomes a positive quantity and represents the excess of matter which should have been removed, *i. e.*, U+E=X. They have a common origin, being the *debris* of the act of living; E the excess of waste in the body will differ in quantity as well as in quality. It will be modified by personal character, by actions, by non-actions, and even by attainments, but especially by attention to, or neglect of, sanitary and moral laws. If E is absent, X is not complete, and X, Y, Z, cannot arise; X even may be complete from the circumstance I have detailed, but Y, Z, are still required to establish an epidemic. If Z is made to correspond to a germ, or living organism, the particulate contagium of any kind of zymotic disease, the multiplying focus of infectious disorder, and one of the eccentric elements in the equation, it has to be introduced from without, and is capable of modification according to the character of the soil into which it may happen to be transplanted. Like the *Penicillum glaucum*, upon which alcoholic fermentation depends, and without which alcohol is not produced, if Z does not gain admission to some part of the humoral system, the entity, zymotic disease cannot arise. Just as *Penicillum glaucum* requires the sugar and the temperature to produce alcohol, so Z, the contagium-particle, requires the food, upon which it increases and multiplies, as well as certain meteorological states, for its proper development. These latter conditions are represented by Y. The severity of the disease will depend upon the quantity of E, the excess of waste which exists in the factor X. The epidemic will be more or less general and fatal according to the quantity of E in each individual, not according to the character.

Carpenter's theory is in exact accord with my own experience and observation. Who are they who most readily "take" infectious diseases? Not the clean skinned, and clean blooded. There is doubtless a great deal yet to be learned, respecting the chemical and physiological changes, which take place in any excess of waste material in the body, what ptomaines, enzymes, or tonic compounds may be thereby formed, and what relations these bear to certain saprophytic microbes, or pathogenic germs. The late Sir Andrew Clark, some years ago, drew attention to the effect, in the production of ænema, of certain poisons arising from the retention of fecal matter in the intestines, as in constipation; and it seems probable that the absorption of certain ptomaines from the same source, gives rise to certain so-called "malarial" affections. In some of these ptomaines formed from excess of waste substances in the body it is possible there may yet be formed essential conditions, special essential

compounds, for the life and growth in the body of the specific germs of infectious diseases, when these have gained an entrance into the body; and possibly for the development of pathogenic, or disease, germs from benign organisms. The bacillus coli communis is naturally doubtless a benign organism. Yet it has long been suspected that it may be transformed in some way into the bacillus of true typhoid fever. At the annual meeting last month of the British Medical association, this subject was again discussed. Mr. H. R. Kenwood, M. D., of London, in a paper on the "Origin and spread of typhoid fever," said: "Evidence was adduced in support of the view that typhoid fever might spring from acute diarrhœa. . . . Was Ebertt's bacillus the *vera causa?* If so, were we justified in assuming that it could proceed from an evolution of the bacillus coli communis? There was evidence that even greater changes than were represented by the slight differences between the Eberth Gaffky bacillus, and the bacillus coli communis, both functional and morphological, might be artificially induced in bacteria. . . . Clinical evidence all pointed to the closest relationship between typhoid acute summer diarrhœa." Epidemiological evidence also, Mr. Kenwood contends pointed this way. Mild unrecognized types—diarrhœa, ambulatory typhoid—"frequently accounted for the origin and spread of typical typhoid fever."

If the bacillus coli communis may be transformed in the body, as, probably, by a foul condition of the intestine and some toxic substance evolved therefrom, into the bacillus typhosus, then we have a clear explanation of the occasional, if not frequent, so called *de novo* origin of typhoid fever, concerning which there has been a difference of opinion, and no little controversy, during the last quarter of a century, many of our most noted scientists contending that it may and does arise in this way.

However all this may be, we have already learned enough, about which there is no question, for a basis for safe work in the direction indicated herein,—that of giving in our preventive efforts much more attention than heretofore to the soil factor.

Respecting the prevention of consumption, for example, before we shall succeed in greatly reducing the mortality from this disease, much will have to be done besides the destruction of the tubercle bacillus, toward which nearly all preventive effort is now directed. Moreover, if as Dr. Prudden of New York estimates, there are over twenty millions of these bacilli cast off daily in the sputa of a consumptive patient with an average amount of expectoration, the destruction of the totals to even a much less harmful extent, from thousands of patients abroad, will be no easy task. Some one has said: "Killing tubercle bacilli seems a futile occupation. Though hundreds of bacilli were destroyed every day, countless millions would survive. If the entire human race should unite to exterminate them, it is doubtful whether it would succeed. In view of this it might seem to some persons wiser to attack the soil formation first."

Sir Andrew Clarke, about two years ago in a lecture delivered at the London Hospital (*Lancet*, July 2, 1892) said in reference to the tubercle bacillus: "Would it not be infinitely better for us to spend less of our time in what seems vain attempts to destroy those mycrophytes, and more of our time in studying the character of the soil in which they will or will not grow? For all my experience points to the conclusion that it is mainly, if not entirely, through the influences which we may become able to exert upon the soil that we may best hope to control or to stay the progress of phthisis."

Dr. Steven Smith Burt, of the New York Post Graduate Medical School, says: "Dealing with this disease it is of primal consequence to keep in view the goal for which we may reasonably strive, namely, to elevate the tone of the tissues and the fluids that bathe them to a sanitary pitch, where they themselves are the best germicides. Bacteria do not thrive upon such nourishment." And Dr. Blachader of McGill Medical School last year said: "We feel convinced that much more can be done by us as physicians in the way of prophylaxis, by strengthening the barriers that Nature raises against the intruders, than can be effected by any or all of our subsequent therapeutic, antiseptic, or germicidal measures."

Respecting infectious diseases generally, it is as Dr. E. Brown says: "We ought to learn to keep our bodies invulnerable to contagion as a fireproof building is impervious to fire; that is, we should be able to resist such moderate quantities of disease germs as we ordinarily or necessarily encounter through life."

Now what are the results of the life saving efforts—of the preventive or sanitary measures, during the last half century? There has been a large increase in the average duration of life; which signifies that many lives have been prolonged that otherwise would have been cut short, for the most part by infectious disease. But while the average of life has been prolonged, it has been done by better hygiene, and increased medical skill among the young and the more weakly members of society. The years of the more healthy and strong have not been increased. On the contrary, it appears there are fewer old people now than formerly. This is remarkable in England, and especially so in Germany.

Furthermore, some diseases are more common now than in past decades. Cancer appears to have increased in England. In Ontario, as I stated in the *Canada Health Journal* in March, 1881, in the decade of 1870–1879, there was a gradual, year by year increase in the number of deaths registered from this disease. In 1879, there was one death from it in every ninety deaths from all causes, while in 1879 there was one to every sixty-one from all causes, an increase of nearly fifty per cent. Since that time I have observed a further increase, but have not the figures at hand. Insanity from nervous affections appears to be everywhere increasing, although a few writers, in the face of the enormous increase of inmates in asylums for the insane, question what seems to be a lamentable fact.

Besides all this and more, recent writers are contending that the race is physically degenerating. In the *British Medical Journal* of August 8, last, is an editorial on this subject, in which, although the editor rather doubts the truth of this contention, he yet writes: "It appears, however, that the average number of recoveries in asylums is less than it used to be—an unwelcome piece of statistics difficult to explain. On the other hand there are dangers to the healthy growth of some classes in our population. The diminution of the rural population, and of employments which harden the muscles, and prevalence of intemperance in food and drink, threaten to lower the tone of public health. In the large manufacturing towns we already see the results in a stunted and anaemic population. These sources of degeneration must be combated by putting in operation healthy influences, and teaching the people to attend to the laws of hygiene. . . . . Although causes are in operation which justly cause grave anxiety for the future, there are as yet no serious proofs that the population of Europe is degenerating. And there are many gratifying signs of improvement."

There are evidently signs of race degeneration, although life has been prolonged chiefly by the protection of the weak from the effects of epidemics. The stronger have been and still are permitted to live unsanitary lives; to live in unventilated dwellings, shops, factories, etc., half breathing with contracted lungs, a foul, prebreathed atmosphere, with unclean, inactive skins and improper food, and, perhaps worse than all, depressing their vitality with tobacco.

Permit me to state here most distinctly that I would not by any means slacken effort in the way of destroying the living germs of disease,—the z of Dr. Carpenter. But let us put forth at the same time, and make it our first aim, to prevent the formation of, or remove the soil for the growth of these germs,—to lessen the quantity of the equation E in the body, and so build up a more vigorous people.

Nor would I abolish even the leaky, "all but impossible," quarantines. But it is outrageous, and worthy only of the middle ages, to detain even for a day respectable immigrants or any other persons, perhaps some of our own people, when just about to enter our door, after a tedious ocean journey, on a cheerless, barren, ill-kept island. It is, perhaps, yet more outrageous to detain a patient with only typhoid fever, as I have witnessed done, in a hospital in proximity to the foulest of privy pits, and in which cases of smallpox were received, on such an island, and, too, in a ward with a fire in an old-fashioned, "tight air," box stove, and closed double windows, in mild October weather.

Rather let the people be brought to understand that in the present state of society, with its constant, close, and universal intercourse, it is impossible to prevent the germs of disease getting into the country; that such germs exist everywhere, and cannot possible be all certainly destroyed; that indeed it is possible they may be developed or produced in a dirty body; and that each individual must fortify his or her own

body by healthy living in order that soil for the growth of the germs shall not be available;—in brief that they must remove from their individual bodies as well as from their dwellings, yards, and lanes, and prevent the formation of, the exciting cause of infectious or epidemic disease, used-up waste matter,—dirt. The time is now at hand when much more than heretofore can be done in this direction, and by the authorities. Public baths of pure water must be more generally provided,—the good effects of such in Europe have been quite remarkable; also public laundries; and if need be, cooking establishments. Simplicity in diet must be loudly preached or enforced;—as well prohibit certain tempting-to-over-eat food concoctions as alcoholic beverages. And, perhaps most important of all, better ventilation in dwellings, shops, schools, etc., must be enforced, and the people taught to breath only pure air, and in abundance with well-developed respiratory organs. Thousands die actually and practically from "want of breath." Some laws respecting the marriage of diseased persons should be enacted and enforced; and it will be a great benefit to the race if some way could be devised for having the delicate subject of sexual relationship better and more generally understood, and the relationship improved, and temperance therein promoted.

In this line of work we might reasonably hope that in time, a race of people would be built up worthy of the goddess Hygeia, which we may as well imagine still exercises a kindly supervision over our health, and would have our bodies fit temples for that most marvelous and incomprehensible work of the Creator, the human mind and eternal soul.

REPORT OF THE COMMITTEE ON CAR SANITATION.

By GRANVILLE P. CONN, A. M., M. D., Concord, New Hampshire.

It is always a matter of congratulation to be able to report progress in any of the great objects which appeal to civilized communities. One year ago, at the meeting of this association in Montreal, I had the honor to present a *resumé* of what I had been able to extract from medical journals and the work of car associations in the United States. This report attracted considerable attention among car companies, and the public who use cars for transportation. The proof of this fact is well illustrated in our programme this year which has no less than four papers upon this topic, while last year only one was presented. There is a great number of people who spend a large portion of their time on wheels, going from place to place in the United States and the Canadas looking after their business, and it is all the more interesting to this association to know that they appreciate our efforts in this work of sanitation for the benefit of the travelling public. These people travel nights from one large city to another, using the car the same as they would a room in a public house, and, paying a good price for that privilege, are entitled to as nearly the same measure of sanitary conditions as is possible with a house moving along compared with one that is stationary. Of course it is not possible to make an apartment or a section of a sleeping-car partake of all the sanitary conditions which might be expected in a large, well-appointed apartment at a hotel, yet a great deal can be done to make it a healthy, wholesome place of rest, and while we are giving our attention to sleeping-cars we should not forget that there are many people who cannot patronize sleeping-cars, and are using common coaches as a means of getting from place to place. A man owning and occupying his own house or domicile can govern the sanitary conditions of the same, but the occupant of the car is dependent upon the sanitary conditions which he finds to prevail, and these conditions are dependent upon those who have charge of the cars in their going from place to place. This only shows the necessity of great care on the part of the management of our railway corporations, and it is a pleasure to report that considerable progress is being made, and I believe within the past twelve months more has been done than during any corresponding period in the last decade. It is a pleasure to report that there seems to be a disposition on the part of those having charge of different departments to hold employés responsible for the work of that department, as will be seen in the following quotation on railroad discipline :

"One of the most essential factors in the proper management of a

railway, and the prompt and safe handling of passengers and traffic, is a form of discipline which shall so educate employés that a maximum efficiency for all may be obtained from a minimum punishment of individuals, by making punishment of the individual secondary to the education of the entire force. Such discipline must produce results of a permanent character, and benefit alike the employé and the employer. [1]"

The report of Mr. Jordan, of this committee, is undoubtedly a clear presentation of the instructions of the management of the Pullman and Wagner palace car companies to their employés, and is a great advance on what was being done a few years since. It is with great pleasure that I can add a further commendation in the fact that I have learned since this report was written that the management of the Wagner Car Company have instituted a school of instruction for all their train employés within the past year.

Soon after the last annual meeting at Montreal, I received from the State Board of Health of Ohio, a circular which had been issued by that board to the railroads of the state of Ohio, which I herewith present to you, and also the report of the general superintendent of motive power of the Baltimore & Ohio railroad, in reply to this same circular:

OHIO STATE BOARD OF HEALTH,
SECRETARY'S OFFICE,
COLUMBUS, O., May 1, 1894.

To General Managers and Superintendents of Railroads:

DEAR SIRS:—With the approach of warm weather, the danger of the appearance of such diseases as are known to have their origin in filth is greatly increased. Recent news from abroad indicates also that this country will again be threatened with cholera during the present year. It is known that the unsanitary condition of many railway stations is quite a factor in the production of these disorders.

It is therefore ordered by this Board that you cause to be inspected all depots, buildings, out-houses, feed yards, cattle pens, chutes, etc., with a view of ascertaining and correcting such unsanitary conditions as may be found to exist.

It is requested that such inspection be made and a report thereof be furnished this Board not later than June 1, 1894, as after that time we intend to have the results reviewed by our own inspectors.

In line with the above, we beg to offer the following suggestions:

Stations should be looked after as regards cleanliness, disposal of excreta, and water supply.

Waiting-rooms and their surrounding yards should be thoroughly cleaned. Horse manure, and animal and vegetable refuse of all kinds, should be removed. Low places about stations collecting stagnant water should be filled or drained.

Care should be taken to obtain water for stations from a pure source. Suspicion should attach to water from a well within 100 feet of an uncemented privy vault. Drinking vessels should be washed at least once daily.

Full or foul privy vaults should have their contents removed and the vault disinfected. A privy vault should never be permitted to be filled up and abandoned without first having its contents removed.

Where water-closets are in use, care should be taken to insure that all fixtures are

[1] From paper by Mr. F. G. Darlington, superintendent of the Pittsburg, Cincinnati, Chicago & St. Louis Railway, Indianapolis, Ind., read at the meeting of the Central Association of Railroad Officers, in Columbus, Ohio, February 19, 1895.

properly trapped, and that the traps are in working order. Closets should be made clean, and it would be well to treat them with liberal amounts of a disinfectant solution.

In the sanitation of trains we would emphasize the importance of giving attention to the following points:

Great care should be taken to insure purity of water furnished to passengers for drinking; and not only should its source be closely scrutinized, but the after care of it should be kept in mind. In this connection, we desire to call your attention to the disgusting and also dangerous method in vogue for supplying water tanks with ice. Where these tanks are charged from the top, the ice, after it is broken to suitable size, is handled at least twice by men with dirty, begrimed, and possibly infected hands; where the ice is brought into the cars by the dirty hands of at least one workman. This practice should be broken up, not only for the sake of cleanliness, but because there is real danger of infecting the water supply of trains.

Water tanks should be thoroughly cleaned at frequent intervals, and it would be advisable when doing so to have them scalded inside.

Passenger cars should be kept in the cleanest possible condition. The frequent practice of sweeping and dusting cars *en route* when occupied, is most reprehensible; it is most disagreeable to passengers, and should be stopped, as the dust so raised may oftentimes be infected. Instead, they should be cleaned by damp mops and cloths.

Each car should be provided with a reliable thermometer, and conductors should be instructed to keep their cars heated in winter or cool weather, not above 70° nor below 60° F. Conductors should also be required to pay special attention to the ventilation of their cars. Urinals and water-closets should be thoroughly cleaned, and flushed with a disinfectant solution at the end of each trip. The floors of water-closets should be mopped with a disinfectant solution.

By carrying out these and other measures of cleanliness that may suggest themselves, railroad companies can do much towards securing the health and comfort of the travelling public; and from the interest you have heretofore exhibited in sanitary reforms, we confidently expect your cordial coöperation in this effort to protect the public health.

As the public is rightfully interested in knowing what is done by your company along the line suggested herein, we beg you to favor us with a detailed report of the work done by June 1, in order that we may embody it in a report we will make on this subject.

Additional copies of this circular may be obtained if desired.

Respectfully,

C. O. PROBST, M. D.,

Secretary.

BALTIMORE AND OHIO RAILROAD COMPANY.
OFFICE OF GENERAL SUPERINTENDENT MOTIVE POWER,
MT. CLARE, BALTIMORE, MD., June 12, 1894.

To the Honorable Board of Health of the State of Ohio:

GENTLEMEN:—We have the honor to submit the following report on the sanitary condition of the grounds and buildings of the Baltimore and Ohio Railroad Company in the state of Ohio, as well as of the quality of drinking water used on coaches running through the state, and steps taken to meet the other requirements set forth in the circular letter of your honorable Board, in response to which this report has been prepared.

Thorough inspection has been made under the superintendence of the Maintenance of Way Department of buildings and grounds; privies requiring it have been cleaned out, and properly disinfected where it seemed necessary, under the advice of the Motive Power Department.

The drinking water used at the various stations to supply tanks in the passenger cars has been analyzed, and the surroundings and general condition of the sources of supply carefully examined, under the direction of the engineer of tests, acting for the Motive Power Department, with the results set forth in the table of analyses attached to this report; from this it will be seen that the waters we use are in no cases of bad quality, and in several cases, of most remarkable purity. In only three cases were the amounts of organic impurities, as shown by the albuminoid ammonia, found higher than desira-

ble, viz.: Cambridge, Sandusky, and Zanesville, and there it was explained by the sediment being stirred up and the water seriously roiled thereby, in consequence of the long and severe storms which preceded the taking of the sample. Under normal conditions, the waters are clear and of good quality.

In regard to handling the ice, in order to avoid infection through its being handled by the employés, instructions have been issued in all cases to avoid touching the ice with the hands as much as possible, and after being put into the water tanks, before filling the tanks with water, a quantity is to be allowed to run through the tank, in order to thoroughly wash the ice and remove all impurities, and we consider that this precaution will meet the requirements of your honorable Board. Instructions have also been issued to scald out the drinking-water tanks at frequent intervals.

To comply with your suggestions in regard to the care of the passenger cars, instructions have been issued to car porters not to sweep or dust the cars en route, and before the coming winter necessary steps will be taken to insure keeping the cars at a comfortable temperature. Many of the cars are already provided with thermometers.

(Signed) DAVID LEE,
Engineer Maintenance of Way.

(Signed) H. B. HODGES,
Engineer of Tests.

Approved:
(Signed) J. VAN SMITH,
General Superintendent.

Approved:
G. B. HAZELHURST,
General Superintendent Motive Power.

The instructions of the State Board of Health of Ohio, and the report of the committee of inspection, at once show that the management of that great road were keenly alive and sensitive regarding the sanitary condition of the cars, stations, and grounds of the corporation. Such reports are encouraging to the friends of sanitation, in the fact that they show that the managers of our great corporations do not in any way seek to shirk the moral obligations which their work entails. It is worthy of notice that an international conference regarding the sanitary administration of railways and navigation has been called in Europe, and has been in session during the past month in Amsterdam. The object of the meeting in general was to consider the methods adopted by various countries to insure the interests of travellers, both by land and sea. To this end it was thought wise to invite members of the medical profession who are specially interested in matters pertaining to sanitation and travel. The work of the conference was to be divided into three sections as follows:

First, guarantees of the capacity of officials.

Second, organization of the medical service.

Third, hygienic interests of employés and travellers.

In view of the international importance of many questions on the programme, the committee invited delegates to be present from various countries, and from railway and navigation corporations. Papers were to be presented, either in the French, German, or English language. It is too early to be able to report any of the work of that organization. It is to be hoped that the first of the questions which was to come before them, guarantees of the capacity of officials, was thoroughly discussed, for I am quite sure the sanitation of cars depends almost entirely upon the work of the train men who have those cars in charge. For the purpose of obtaining information from railway officials, regarding sanitary work along

these lines, a circular letter was sent by your committee to several of our large railway corporations, of which the following represents the interrogatories which were placed before them:

1. Has your road any system of sanitary inspection of passenger cars, interchanging with other roads, or between divisions of your own line?

2. Do you believe such an inspection, conducted on comprehensive rules like that of inspection of wheels, etc., would be practicable and result in better sanitary conditions?

3. What improvements can you suggest in the heating, ventilating, and cleaning of cars over those now in use by roads in general?

4. Is your road making any experiments in the way of improving the heating and lighting of cars, and have you ever used compressed air in the cleaning of ordinary coaches?

In sending out this circular letter I had in mind that general passenger agents, better than any other class of railway officials, should be able to give me information regarding the sanitary condition of passenger cars. At the same time I had many misgivings about sending such a circular to these men, as it always seemed that they had but little, if anything, to do with the rolling stock and cars which conveyed the people over their lines. However, I addressed this circular to some of the general passenger agents of our largest corporations, but was not surprised that in their replies I was referred at once to the manager of the rolling stock of the road. A general passenger agent, representing one of the largest systems in this country, after acknowledging my circular letter, said: "The matter referred to is under the control of the operating department, and I have referred your letter to him." Another letter, begging him to give me his opinion regarding car sanitation, brought this reply: "I beg to say that the matter of car sanitation is outside of my department, and I do not feel qualified to express any opinion on the subject." Now it is a well-known fact that scarcely any person can be found but is able to give an opinion regarding the cleanliness or other conditions of a house or an apartment, and because this general passenger agent declined to give an opinion on the ground that he was not qualified, does not to my mind express any idea that he is a man unqualified for the position which he occupies. I have not the honor of a personal acquaintance with the gentleman, but his name is a household word among the corporations and men who have anything to do with the passenger work of this country. He is a well-known member, and has often presided at the meetings of general passenger agents of this country, and is a member of the international association of railway passenger agents. He often addresses them, and his work in that direction is always edifying to his audience. I have often read his literary productions with pleasure and profit, and I think it can be truly said that he is eminently well-qualified to give his opinion on this subject were it not for this fact, that it is the design of all railway corporations to keep their several departments absolutely by themselves; consequently for him to

have given an opinion upon that subject, might have had its influence upon some other department, therefore he felt that it was not his duty nor his privilege to make any remark about things that he could not control.

Substantially I got the same answers from other general passenger agents, showing that this road was not an exception in its management of these affairs, and under these considerations I think it would be impossible to get an expression of opinion upon the subject from a general passenger agent of any road, whether it would be better that the sanitation of the passenger cars should be under their general supervision. Be that as it may, it is easy to understand that the general superintendent of motive power, being a man well versed in mechanics, naturally gives his first attention to the locomotive that is to draw the train, and but few of them ever get beyond that, taking but little thought of whether that locomotive is drawing freight or passenger cars.

To this circular letter a general superintendent of the motive power on one of the great systems of railroads which centers in Denver, through its general manager, replied as follows:—

GRANVILLE P. CONN, M. D.,
Concord, New Hampshire.

DEAR SIR: Your letter of June 22nd, addressed to Mr. ———, with reference to the matter of car sanitation, has been referred to me, and the delay in sooner replying is due to urgency of other important matters.

Answering your principal questions in the order given, I will say,

First. We have no system of sanitary inspection of passenger cars interchanged with other roads, or between divisions of our own line.

Second. I do not believe such an inspection could be properly inaugurated and conducted, except on the same basis as the inspection of cars for interchange is now handled; and that an inspection on such a basis would result in slight benefits, which would in no way be commensurate with the immense expense to the railroads necessary. In other words, the expense to the railroads of itself would prevent any such plan being successfully carried out.

Third. Without going into an extended investigation of the matter, I should not feel warranted in making any general suggestions on this matter.

Fourth. For the past two years or more we have been cleaning our passenger cars with compressed air, the results being very satisfactory, as a much better job of cleaning can be done in this way than with the old method.

We are at present making no experiments in the way of improving the heating and lighting of cars.

Yours truly.

Another large corporation having one of its termini in Denver, remarks:

"We have no system for sanitary inspection of cars at interchange points, nor do I believe that such an inspection could be conducted as that of looking after wheels, nor would it be necessary or practicable, as at our terminals where the coaches are cleaned, this matter is carefully looked after and properly done.

"Relating to improvements in heating, ventilating, and cleaning cars, I think that steam heating is the best now in use and a great improvement over the old stove, and compressed air the best for cleaning coaches. The problem of ventilating cars properly without letting in dust and dirt is difficult to solve. We think to let in fresh air just below the line of the seats would be an improvement over the present system, if arrangements were made so that the cold air, before entering a car, would be heated to a certain temperature.

"Of the total passenger equipment, 454 cars, we have at this time 187 cars equipped with Pintsch gas, and 306 cars equipped with steam heat. For the past eight months we have been using compressed air for cleaning all coaches, mail, baggage, and express cars."

I do not believe these answers to my circular letter are really the opinion of the management of these roads, nor what is for the interest of their corporations and the public, therefore I will not give the names of the corporations, believing that within another twelve months we should get very different replies, and which would indicate the progressive conditions that are now developing all railroads throughout the country. That corporations may be unfortunate in the selection of men is but a natural sequence to the employment of large numbers of men. Neither can it be expected that a man having all he can do in supplying the necessary power to move trains over long lines of road shall be able to look after all the minor things connected with train work. Therefore it is but natural that the cleaning and the general care of the cars should be left to subordinates who, having even less knowledge of sanitation than the master mechanic, make but poor substitutes to do the work that is expected of him.

I am very glad to be able to report the progress in sanitary work which other great lines have made during the past few years, and it is with pleasure that I bring to your notice the work of one of our best lines from the Atlantic coast towards the interior of our country, and the following, in answer to my circular letter, will give to every true sanitarian a feeling of pleasure that we have entered upon a reform in matters pertaining to railway hygiene. I give the letter entire, as the best expression of my approbation of the work which this road is doing:

CHESAPEAKE AND OHIO RAILWAY CO.
W. S. MORRIS, SUPERINTENDENT MOTIVE POWER,
Richmond, Va., June 26, 1895.

MR. GRANVILLE P. CONN,

Vice-President, American Public Health Association, Concord, N. H.

DEAR SIR: Your circular letter of June 22d addressed to our general manager, Mr. Geo. W. Stevens, has been referred to me.

Referring to the interrogatories attached, have to say, in answer to,

Question No. 1. Our inspection of passenger cars at interchange points embraces necessary common sense sanitary inspection, in other words, the closets, urinals, etc., are thoroughly inspected and cleaned before leaving terminals, and our standard disinfectant applied to all places exposed to any unhealthy condition. Our disinfectant is practically

the same as used by the Pennsylvania Company, I attach hereto a copy of specifications for same.

Question No. 2. I think this is covered in my answer to question No. 1.

Question No. 3. The only suggestion that I have to offer in regard to heating and ventilating as well as cleaning of cars, is to discipline thoroughly all of the train men and employees connected with this branch of the service, so that they will be alive to any sanitary requirements needed for the healthy condition of the trains.

Question No. 4. The Chesapeake & Ohio Railway Company is far in advance of any other railway company in the United States in the way of heating and lighting its cars. We clean all of our coaches and carpets by a pneumatic process every trip the cars make. In the matter of heating, our coaches are heated by hot water circulation without the use of stoves, the heat being transmitted from the locomotive through necessary piping to a system of drums, etc., placed underneath the car, which raises the temperature of the water of the pipes within the car, thus producing circulation and any temperature desired, from atmospheric to a comfortable condition within the coach.

We claim for our light, to be absolutely the pioneers in the use of storage electricity. All of the coaches of our through trains are thus lighted, avoiding unnecessary heat and danger from oil lamps, and in connection with this latter would say that we are successfully operating a system of storage batteries, wherein each car is independently lighted and charged for thirty-six hours continuous lighting, by storage batteries. We have in our local trains quite a number of cars lighted by the Pintsch gas system, which avoids the old time danger of using oil lamps, and is a very satisfactory light, but in the summer time there is some heat generated from the light, which our electric lights entirely eliminate. We have numerous tunnels to run through, and being located geographically in a section of the country where the summers are long and midsummer quite hot, we have given all of these matters of sanitary inspection and the necessary requirements for the comfort and health of passengers very careful attention, and with our improved methods as described hereinbefore, we have the best ventilated cars in summer as well as the most healthful condition existing in all of our trains, from one end of the line to the other, that can possibly be brought about at the present time.

We go as far as to use in our locomotives the New River smokeless coal, and avoid to the lowest minimum the annoyance of smoke and gases.

As regards your suggestion of confining ourselves to the lines of your interrogatories, would say that we appreciate that any railroad taking the steps that we have, the volume of trade will certainly recognize their efforts, and we are proud to say that we enjoy at the present time this recognition of our wholesome efforts to make our patrons safe, healthy, and comfortable.

Trusting this information will be satisfactory, I beg to remain,

Yours truly,

W. S. MORRIS,

Superintendent Motive Power.

The disinfectant to which reference is made, is very similar to that which is used upon nearly all roads, and the directions which are given to the employés are very direct, and which if obeyed will keep everything in as good sanitary condition as any substitute for cleanliness. The instructions for the care and transportation of the dead are the same as have been adopted by the general baggage agents throughout the country, and have received the approbation of boards of health as well as of this association.

Regarding the difficulties of inaugurating a system of railway and car sanitation, Dr. S. S. Herrick of San Francisco, Cal., communicates the following, which may apply to conditions existing in other sections of the country, therefore I quote that portion of his letter.

"Since coming to this city I have made several efforts to get the managers of the Southern Pacific Co. interested in the subject, but with no success. This company has expended probably not less than $1,000,000 on its law department and for political purposes, and has a medical department sustained by a stoppage of fifty cents a month on the pay of all employés. Some thousands have been appropriated for building hospitals, for treating sick and injured people, but the prevention of sickness is totally disregarded. In this respect, however, this company is ranged with the great majority of railroads."

One other topic connected with the hygiene of passenger cars is brought to my notice by Dr. E. R. Lewis of Kansas City, and a member of this committee, which I give in his own language. It has its own peculiar significance to every person who has occasion to patronize sleeping coaches. He says:—

"There is a point to which I wish to call your especial attention, which applies probably more to our lines than yours in New England, and that is the transportation of tuberculous cases to and from the Pacific Coast. We have two through lines in our city coming direct from the Pacific, of course reaching every point in the south, east, and north, and it is astonishing what a great number of consumptive people these sleeping cars convey.

"Only a few weeks ago I was on one of our California lines, and succeeded in getting into a berth for the night. The next morning when I got up and the car was all straightened up, I fell into conversation with my neighbors and found that they were very much surprised to find that I would occupy the berth I had during the night, for they told me the worst consumptive they ever saw had been taken out of the berth but an hour before I got in, and although there were three other consumptives in the train, which I considered in the last stages of the disease, they were in no manner specially cared for in reference to the spread of their trouble to others. As for myself I felt it mattered but little, but for the good of the community at large, and for the benefit of the railway service in particular, I believe that the railway company that would set apart a certain car or portion of a car for this class of cases, would be the road receiving the largest patronage from the public. For to all thinking people of to-day, knowing the infectious character of consumption, they avoid such contact as they would a deadly enemy, and the education of the public has grown so rapidly upon this point, that to my mind the day is not far distant when even the busy railroad manager must stop and solve this problem, if he complies with the demands of the public.

"In calling your attention especially to this matter, I do so for the purpose of bringing the subject before the American Public Health Association, for through them it may properly reach the proper officers of our large railway corporations, that they may give it due consideration and act wisely upon this suggestion."

The conservative manner in which Doctor Domingo Orvanaños of the

republic of Mexico has treated the subject of car sanitation I most heartily commend to the public and the railway managers of the countries now embraced by this Pan American Association. The sentiments contained in his report are those of wisdom and ripe judgment, and are worthy of the man as well as an honor to the republic of which he is a representative sanitarian.

Professor Woodbridge's paper will commend itself to all and should receive the approbation of all railroad managers as it is an exposition of the subject from a scientific standpoint.

In conclusion allow me to add, the public are becoming more and more critical each year upon matters connected with the hygiene of cars and hotels, nor is it considered out of place to commend or condemn the sanitary conditions obtaining along lines of public travel and in vacant lots.

The world moves on, and sanitation that would have been considered fairly good a decade since, will not be tolerated without a protest to-day.

The through line that takes the most advanced position in alleviating the discomforts of the traveller; that shows by the cleanliness of its cars, their heating and ventilation, and above all by the uniform courtesy of their employés, the fact that they have a department of hygiene as well as of surgery, will reap its own reward, and save thousands of dollars in its advertising department, for no amount of printer's ink will cover want of courtesy on the part of train men, nor of unnecessary want of sanitation of the car service, neither will the public hesitate to proclaim to the world their dissatisfaction.

On the other hand, to receive the full and entire approbation of the travelling public is an advertisement that money will not buy, and to obtain which should be the ambition of the management of every railroad corporation.

By E. C. JORDAN, C. E., Portland, Me.

The following data was obtained before and after my business was known to the local care takers.

METHODS OF CLEANING SLEEPING CARS.

From observations during the cleaning of the Boston, Chicago & St. Louis limited, corroborated by observations of various trains in Fitchburg and Albany yards.

This train arrives in Boston at about 10 p. m. and leaves at 3 p. m. the next day (same cars). On the arrival of the cars in the yard the outside men (so-called) dust off the cars and wash the running gear; the inside men open the windows, remove the linen and carpet and dust out the car with feather dusters; this is done at night if the weather is favorable, as the case has been the past week. In the morning, after airing the car all night, the matresses, blankets, and curtains are thrown or handed out

onto a rack supported by horses, and thoroughly beaten, the mattresses on both sides, and brushed each time; the curtains and blankets are shaken very vigorously. Meanwhile the springs have been taken out and dusted and the berth dusted and wiped out with a wet, then dry, cloth. This mattress and blanket dusting took the men about an hour. The mattresses, blankets, etc., are then returned to the car, and the cushions and pillows are put out and go through the same process, while the pillow-boxes are cleaned and the floor under the seats dusted. The cushions are then returned and clean linen head-rest covers put on. The floor is then brushed and washed. Then all wood work, except inside of the berths which have already been treated as above described, is washed with castile soap. While this is being done the outside of the car is washed including the windows. The inside of the windows is next washed, brass work cleaned and lamps attended to. The closets and urinals are next washed (all water used inside having been emptied into them) and disinfected. The windows are again opened, berths partly lowered and car remains this way until about half an hour before the train leaves the yard, when the carpet which has been beaten, and spots, if any, cleaned, is brought back and put down, and the car is again wiped with a moist woollen cloth inside and out.

The foreman called my attention to the fact that they did not leave the bedding, etc., out to air very long as they have no room here, but he says in New York, Buffalo, and Chicago they have a shed without sides where all the bedding, etc., from a whole train is put, cleaned, and left until the cleaning of the cars is accomplished.

The following statements are what I learned from conversation with the foreman of the Wagner yard:

The St. Louis train has the longest run of any train having sleepers entering Boston. The New York, Albany, and Buffalo cars are cleaned the same way, except that the car is not entirely stripped, carpet not taken up and cushions not removed but once a week at each end. (This same practice is also carried out on sleepers owned by the B. & A. railroad.) The above do not have as long a run as the St. Louis express. The cars are sent to the works every four to six months and completely renovated (new mattresses, bedding newly upholstered, etc.). New blankets are put in about once in two or three months and old ones sent to the works to be renovated. The conductor's report at the end of the trip shows whether or not any invalids occupied berths in his cars and the nature of their complaint; if contagious, the car is laid off and sent to the works, but in cases of consumption (See note in letter), or something not considered contagious the bedding and curtains of that section only are sent to the works with an explanation of the reason for sending. He also informed me that the inspectors of the company were very strict about the sanitary condition of the cars. Disinfectants are carried on all cars to be sprayed about if any odor is detected. I was shown over the

store-rooms for linen, etc., and commissary and found all to appear very neat.

I notice by reading your letter again you ask "how thoroughly are mattresses, etc., beaten?" Answer. Until no dust arises when struck with a beater.

By Dr. DOMINGO ORVANANOS, Mexico, Mex.

To the Chairman of the Committee on Car Sanitation.

Mr. Chairman: The subject of railroad car sanitation is, in my judgment, one of the most difficult questions presented with respect to public hygiene, on account of the difficulty of reconciling the demands of the latter with the interests of the railroad companies and the general convenience of the public. I do not feel competent to speak at any length on this subject, as I have had no opportunities of acquiring personal experience of it, or even of the special conditions of the railroads in my own country, which I may state are entirely distinct from those found in the northern part of this continent.

The railroads in the Mexican republic traverse regions which, generally speaking, preserve an elevated temperature during the whole year, the result being that the ventilation of these vehicles can be carried out without any trouble whatever, by opening several of the windows, and thus obtaining an almost constant supply of perfectly pure air. In the sleeping cars there is no inconvenience caused by using the grating or ventilator which is usually placed in one of the windows at night, as the air which is thus admitted is never very cold and does not produce those frozen currents which are noted by the traveller in the railroads of the American union. I have observed that almost all travellers in that country require the ventilators to be taken off and the windows to be lowered, whilst in this republic the contrary is what happens. With respect to cold countries, it appears to me very difficult to determine the proper manner of introducing into the railroad berths the quantity of pure air that a man requires per hour, without at the same time introducing violent changes of temperature. In fact, these berths have a capacity of two cubic metres, and man requires for breathing purposes thirty cubic metres per hour, so that in order to furnish him this quantity, it would be necessary to renew the air within those reduced spaces fifteen times per hour. As the resources for heating which are now at our disposal are so limited, they could only elevate the temperature of the renovated air after the lapse of eight to ten minutes, the result being that it would be necessary to decide for one of the two extremes—a frozen current of air, or impure air. Up to what point can the public hygiene be reconciled with the exigencies of traffic and a diminution of the supply of air? I believe that this will have to vary according to the circumstances of pressure and the temperature of the atmosphere, and that

experience will teach us the concessions which can be made in each case.

I do not propose at present to enter on a description of the different systems of ventilation which are in use on railroad cars, such as the Wolpert and Brunning ventilators, as well as many other arrangements of a simple and effective character which I have seen adopted on many American railroads, both for the insufflation as well as for the extraction of the air, as these are already well known to yourself. I believe that, generally speaking, these fulfil their object as far as regards the ordinary cars, but not as regards the sleepers, in which each one of the passengers, especially all those in the lower berths, is absolutely isolated as far as regards ventilation from the rest of the car.

If the question of ventilation is such a difficult point for decision, still more difficult is that which refers to the prevention of the transmission of disease. In this matter we also enjoy in this republic, certain favorable conditions which tend to prevent this propagation, and which are: first, that almost all the railroad cars excepting the sleepers are furnished with rattan and simple uncovered wood, instead of cushions, upholstery, or hangings, so that it is very much easier to clean them, and they give better guarantee of cleanliness; second, that only a comparatively limited number of persons travel, and third, that two of the most infectious diseases of other countries, tuberculosis and diphtheria, are very rare in some regions and entirely unknown in others. The exanthematic fevers, that is to say, small-pox, measles, scarlet fever, and typhus, which certainly are common in all these sections, rarely or never are propagated in railroad cars, for reasons which can be easily understood; and, in fact, no person suffering from small-pox even during the period of scaling is allowed on the railroad. The children who have been suffering from measles or scarlet fever are in this country confined to the house for several weeks, even in the poorest class. It cannot be doubted that persons who are convalescent from typhus fever have often travelled on the railroads, and must have propagated the disease amongst the other passengers; but as can be easily understood, no opportunity has yet been found to identify such a propagation. Speaking of typhus and of all infectious diseases in general, it is the bounden duty of all local sanitary authorities to prevent the embarkation of an individual who is convalescing from such diseases. Such an evil cannot be remedied, once the convalescent is in the car, even if his condition should be discovered and an attempt should be made to apply any remedy, as it would probably come after the disease had been propagated to one or more persons.

I have carried out some investigations with the object of ascertaining the diseases that could have originated in this country on the railroad, and I have only heard of some cases of bronchitis, of pneumonia, and a few of pleurisy. Considering the genesis that is now admitted with respect to these diseases, we may attribute them to a zymotic origin;

but the truth is, that the immediate cause in all these cases has been a chill which has been taken through the imprudence or carelessness of the passengers themselves.

As I have to propose to you, Mr. Chairman, the measures that might be adopted on the railroad with a view to preventing the propagation of diseases, I now present those which occur to me, although they have been proposed on other occasions, as I believe that in treating of measures of this class, it is always necessary to insist on them until their adoption is obtained.

The measures are as follows: First, watchfulness on the part of the local sanitary authorities to whom pertains each of the railroad stations with large traffic, and with the object of preventing the embarkation of individuals who might transmit the diseases. Second, the appointment of medical inspectors on the lines or in the places where it is considered necessary. Third, that the railroad cars should be furnished with cushions and hangings that can be easily taken off and replaced. Fourth, the disinfection of the cars themselves, either wholly or in part, whenever the medical inspectors should deem it advisable. Fifth, the prohibition under severe penalties, of expectorating in any part except in the cuspidors, of which a sufficient number should be provided and which should contain a solution of bichloride of mercury of 1 to 1,000.

These, Mr. Chairman, are the observations which I now present with respect to the interesting subject of railroad sanitation.

ON THE VENTILATION OF RAILWAY COACHES.

By Prof. S. H. WOODBRIDGE, Boston, Mass.

The problem of railway coach ventilation is set about with many phased difficulties. They are found in the indifference of corporations, in scepticism of managers, in the ignorance and negligence of employés, in the mischievous thoughtlessness, imaginings, and wilfulness of passengers, in the adverse mechanical conditions to be encountered and overcome, and in the expense involved. It may be safely affirmed that the greater difficulties are found on the psychical rather than the physical side of the problem. The mechanical problems involved are susceptible of a possible complete, though not an easy, solution. To move corporations to an effective moral and humane conviction and purpose; to rouse, unify, and direct public sentiment which shall so demand as to secure its rights; to train that public to know and observe the proper uses and limitations of those rights;—all this is a vastly more difficult undertaking than to move, cleanse, and warm or cool air, and to distribute it through and remove it from a compartment. The greatest discouragements the sanitary engineer devoted to his calling must face are found in human frailties rather than in the meagreness or inaptness of the remedial efficiencies which nature makes available.

The absence of any practically employed and generally approved method for effecting railway coach ventilation affords the most potent reason possible for search, and even costly experimentation, in the effort to discover such a method. Failures should not be allowed, for an instant, to serve as a defence for complacent inaction.

It is the design of this paper to briefly discuss present and possible railway coach ventilation from a mechanical standpoint solely, and if possible to contribute some little to the development of an important branch of public hygiene.

The necessity for ventilation increases, first, with the length of time of an occupant's exposure to the air of an inclosure; second, with the morbific quality of the air to which he is exposed; and third, with the occupant's susceptibility to the atmospheric conditions. In general, therefore, it may be said that the relative necessities of car ventilation rank below those of continuously occupied inclosures, and also below those of rooms occupied at regular and frequent intervals for periods extending over several hours. Such ventilation as is essential to the best results in the contagious wards of a hospital is not to be thought of as necessary in car ventilation. The contagiously sick must not be allowed contact with the well; they must be provided with an ambulance coach, or with an isolated and insulated compartment. Neither is ventilation, such as should obtain in the periodically occupied school room, called for in the railway coach.

And, furthermore, the coaches making up accommodation trains require less artificial ventilation than those of through or long distance trains, since the frequent opening of doors and inward and outward moving of passengers serve more or less effectively as means of natural ventilation.

In all ventilating work regard should be had, also, to the per capita space of enclosures as affecting both the liability to draftiness in ventilating work, and also the time of retention within the inclosures of vaporous or organic matter eliminated from the bodies of the occupants. The latter is important because of the rapid process of decomposition and putrefaction which takes place in such matter in the presence of moisture and warmth, so that the longer it is retained the more offensive and, presumably, the more dangerous, it becomes in quality.

The general inside dimensions of a railway coach are approximately 8x9x60 feet, and the seating accommodations vary from sixty to seventy for ordinary day coaches, making a cubic capacity when clear of passengers and furnishings, of about 4,300 feet, and giving a per capita space of a little more than sixty feet. Should the air volume supplied and removed each two minutes, be equal to the cubic contents of the car, the individual supply would be thirty cubic feet per minute, or 1,800 cubic feet per hour, and the total quantities would be for each car 2,100 cubic feet per minute and 126,000 cubic feet per hour.

To regularly and continuously supply such a quantity, properly cleansed, warmed, and distributed, necessitates the employment of means which shall not be dependent either upon the motion of the cars through the air, or on the rotation of the wheel axles. The system should be one, also, whose working will suffer a minimum effect from the opening of either windward or leeward windows. The inadequacy for meeting these conditions of the now prevalent methods of ventilating by openings at the top of the car ends, which openings are usually placed beneath the platform roof or hood, must be easily apparent. The air movements through such or any other openings must be as variable and unreliable as are the pressures on which they depend. In a twenty mile wind, a car running at forty miles an hour against the wind experiences a pressure whose value may be indicated by 65. If the wind's direction crosses that of the train the pressure falls to 45. If the train and the wind's movements are identical in direction the pressure drops to 25. With a lower rate of wind travel and inequality would, of course, be proportionately less, and at a higher rate greater.

As great an inequality as is above indicated may, however, be found in the cars of one long train. The engine takes the brunt of the air pressure due to the movement of the train, and as the successive cars follow it the air takes up their motion, the movement of the cars relatively to the surrounding air growing sharply less as the distance from the engine increases. The use of vestibule cars in trains made up for long runs interferes with, if it does not preclude, the use of such means of ventilation as end openings. With the development of high speed in railroad

service will doubtless come a construction of cars aimed to reduce to a minimum all air resistance, and that construction will have reference to as smooth and unbroken surfaces as are practicable from end to end of trains, and very possibly to a wedge-shaped form given to the locomotive front, and to the rear end car also. It seems not improbable, therefore, that the now usual and primitive method of ventilation for through trains may give place to others ere long, under the necessity of mechanical rather than of sanitary considerations. Purely mechanical considerations would omit ventilation entirely, and in such a period of transition as now seems imminent the public's insistance on its hygienic rights is timely.

Approaching now a study of possible methods by which adequate and uniformly maintained ventilation may be secured for railway coaches, the following general principles may be accepted as fundamental: The air must be furnished by other than, so called, natural means. The supply rate must be as little as possible affected by the movement of the coaches or the wind. The air should be continuously and regularly supplied in generous quantity and distributed and entered and removed without annoying drafts. The action of the system should be plenum rather than vacuum in order to reduce the inward leakage of cold air, smoke, dust, and cinders. The heat should be generated at the floor, evenly distributed and well regulated. The air should be entered properly warmed and cleansed, and in such manner as to effectively reach all occupied parts of the car and to completely and equally dilute in its movement through the car, all eliminations thrown upon it.

To avoid disturbing wind or air pressure effects, either a velocity must be given to the air entering from the outside highly in excess of that which the average minimum pressure would produce, or the inlet aperture must be so automatically regulated with reference to pressure as to ensure convenience of flow. For the former method a high efficiency fan would be requisite. A double inlet, nicely balanced cone fan of the blower type, 18″ in diameter and run at 1,800 revolutions per minute within a chamber specially designed for free air movement and avoidance of noise, could be run by a one-half horse power rotary steam motor, taking its supply from the steam main beneath the cars, and passing its exhaust either into the heating system or outboard, as weather conditions require. The fan might be run, but at greater cost of power, by an electric motor given by a small storage battery supply from a dynamo run by belt or other connection with the car wheel axle, the function of the storage being merely to furnish a current when the car is at rest.

To cleanse the air of dust and smoke it must be passed through a suitable filter. If that filter is, in make, a dry strainer, it must have an extended area and be made readily movable for cleaning. Such a filter of some forty square feet surface could be made of fine wire gauze on the intake side and the necessary thickness of fibrous material, such as cotton wool placed back of the wire netting, the filter being so made

on frames joined in W form by hinges as to occupy a compact space and to be easily removed and cleaned.

For warming 126,000 cubic feet of air from a minimum of minus 10° to plus 65° would require about 180,000 British thermal units imparted to it, a quantity to be gotten from 70 to 75 square feet of well-disposed steam surface. For the regulation of the air supply, temperature, and for protection against freezing in the steam pipes, the surface may be divided into two sections, one of which should have valves automatically controlled, and the others brought into use as called for by weather conditions.

To enter the air into the coach without danger of annoying local drafts, and to adapt the method to sleeper, parlor, and day coaches alike, it would seem most feasible to employ one or more overhead channels through which the air could be delivered laterally to one half of the car. The monitor roof construction would furnish ready accommodation for such an arrangement, the air being made to enter through the two sides of the monitor space. The air's density at 65° would cause it to settle floorward with a moderate motion, and the location of inlet and outlet could be so chosen as to cause the air once delivered into the car to take up a movement toward the other end from that at which it is supplied. At the other end of the car it should be given a free ceiling discharge.

If desired the supply could be given a floor delivery by substituting for the guards which now cover the steam pipes, boxes having about two thirds a square of foot free area each, the boxes opening beneath the seats for the delivery of air. The objections to such a method are chiefly two: First, steam pipes could not be accommodated within such boxes because of the accumulative heat imparted to the air in the transit through them, and the resulting great inequality of heat distribution. To place the steam pipes outside such boxes would be to seriously encroach on foot room. Second, the issuance of air in strong current near the floor would tend to stir up and set afloat the bacterial dust which it is prudent to disturb as little as possible. The resort to floor entrance of air does not seem necessary when the air can be entered from above with such temperature and resulting weight as to cause its gentle but sure precipitation, and when the action of the large area of cool window surface serves the part of an active ally in the process.

The automatic regulation of the temperature of the cars and of their air supply is a matter of mechanical delicacy rather than of difficulty. It is to be regarded also as one of the first importance, because of the large aggregate of discomfort due to the overheating of railway cars and because of the annoying, if not dangerous, relief sought from such discomfort by opening windows and even doors.

To enter into a detailed description and discussion of the method thus briefly outlined, would prove burdensome, and especially so without illustrative drawings, the execution of which urgency of professional work has made impossible. Such matters of detail are, however, of a professional and public interest, such that should your association honor this initiative

and meagre presentation by inviting further discussion, the requisite study and work will be most gladly undertaken in order that the results may be put before you.

The development of the electrical propulsion of railway coaches promises to lend itself to the advancement of such work as is under discussion, especially on suburban and shore routes. It will reduce dust, and remove the smoke and cinder elements from the problem; and by reducing lengths of trains, it will make ventilation without mechanical aid more reliable, and will furnish a convenient means for applying that aid when required. It will also tend to hinder the desired advancement by substituting for that low cost agent for heating, steam, electricity, of so much greater thermal cost as to make it an effective excuse for not providing generous ventilation, the heat in the steam used to develop one electrical horse power being from five to ten times greater than the produced electricity would yield, the steam used in fan driving being, moreover, available for heating purposes.

Finally, it should be remembered that in all ventilating undertakings, but one half of the requirements are fulfilled when the most perfect apparatus conceivable is furnished. The excellence of a tool does not ensure the quality of its product. Quite as much depends upon the uses as upon the tool, and not infrequently a superior apparatus is made, in its reputation, to bear the burden of the operator's infirmities. It would seem to be of more than doubtful utility to equip coaches with carefully designed means for ventilation, unless railroad employés are systematically trained to their use, and they and the traveling public are educated to habits of cleanliness, and are free from the trouble-making notions and imaginings which prevail, even among cultivated people, with reference to ventilation. The proper function of ventilation begins only after cleanliness has done its most perfect work. For a long time to come to an innocent and dutiful ventilation is even likely to be lain the sin of uncleanliness of person and environment.

Ventilation deals with unseen air, unseen aerial movements, and generally with unseen motive forces. The field is rich for a rank growth of notions and imaginings and quackery. Hence the large and important part imagination plays in ventilation effects. Those effects are primarily on a composite and delicate sensorium upon which imagination plays ruthlessly. It is important, therefore, that any system planned to give the surest and highest satisfaction should furnish ocular evidence of its existence and of its action. In a well-ventilated room a raised window through which no air moved inward has often been known to give great and immediate relief. Any successful coach ventilation must include such self-announcing means as shall enlist imagination in its favor, and put an effective stop to window raising, that fatal disturber of the working of artificial ventilation. The railroad management must also be called upon to provide whatever may be required to remove every reasonable excuse for window opening.

CONTRIBUTION TO THE DISCUSSION OF RAILROAD HYGIENE.

By Dr. THOMAS NORIEGA, Mexico, Mex.

The science of preserving health would be very incomplete if we neglected the study of even one of the conditions under which mankind lives, in either his individual or collective character.

The student of hygiene has at all times had a vast horizon before his eyes and an always fertile field for his beneficent investigations, but never as in the present day has he been able to take such high flights. In the present day, when biology has completely separated itself from all other systems, and that supported by analysis and experiments, it explains with certainty, even with difficulty, the laws which control its phenomena; to-day, when the sciences which are so unjustly denominated "accessory," throw a strong light on the obscure depths of the science of life; and lastly, when the rules discovered by science have opened a way even into parliaments, to-day, I repeat, more than at any previous period, are the labors of the student of hygiene rewarded by an exuberant and faithful harvest of results.

Only a very few years ago nobody would have dared to undertake a journey by land from our capital to the city of New York, and the few who were bold enough to do so accomplished the journey with untold sacrifices. Now we travel much longer distances, comfortably reclining in the upholstered seats of a railroad coach, and sleeping at night in the comfortable beds of the sleeping cars.

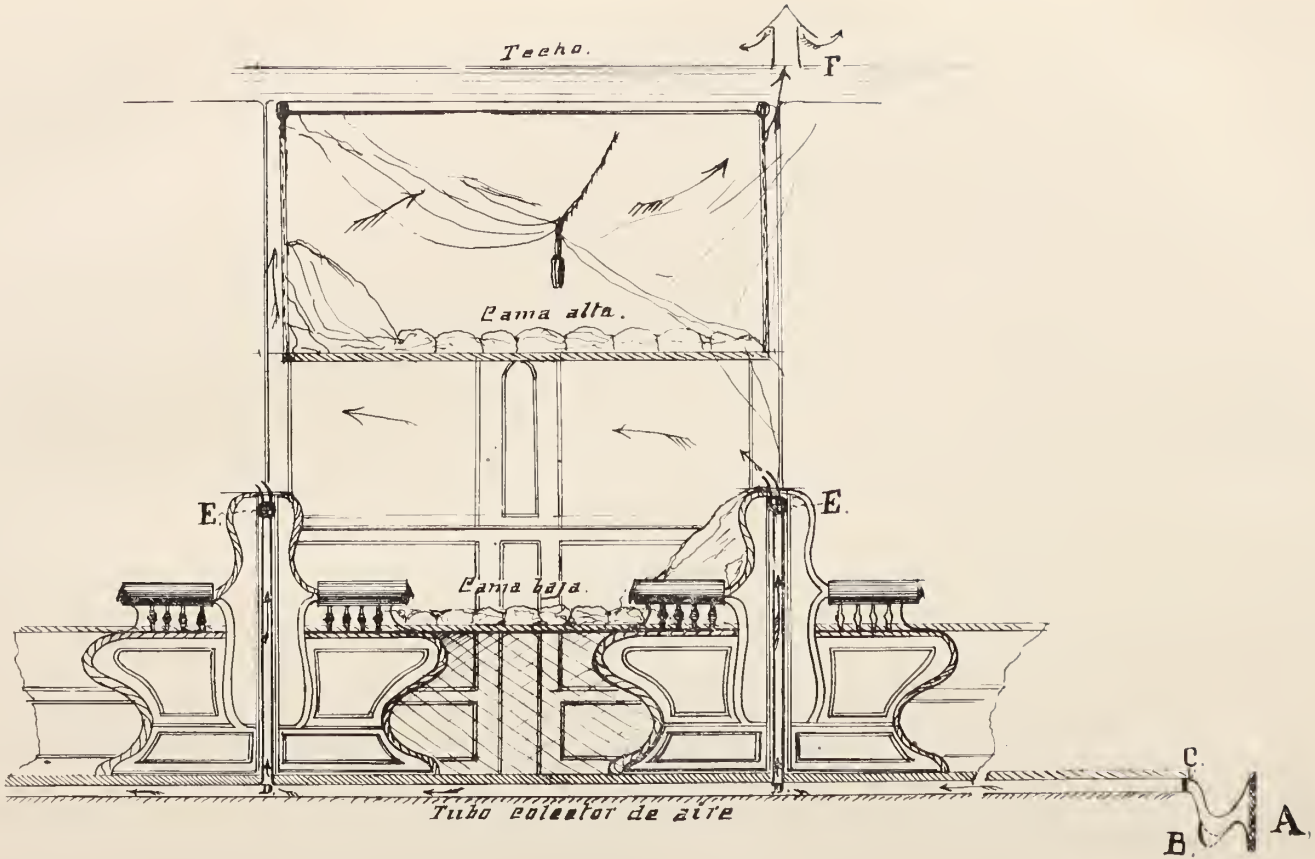
But it is necessary to remember that by the side of these seductive comforts and facilities are hidden serious menaces to health: the rapid and elegant railroad cars can be converted, when the occasion arrives, into a fatally dangerous luxury.

It is not my intention to point out all the subjects connected with railroad hygiene. I only desire to call your attention to the following two important questions:

1. The ventilation of sleeping cars.
2. The sleeping cars as a source of infection.

I.

The first thing that excites the attention of the traveller who for the first time sleeps in the berth of a Pullman car is the suffocating heat which he there suffers, even when he is travelling in the depth of winter. It forms a singular contrast to the cold which he feels on going out on the platform, and the persons who are suffering from obesity, from cough, or


Techo.
F
Cama alta.
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E.
Cama baja.
D
Tubo colector de aire
C
A
B

heart affections, feel a positive thirst for oxygen when they go to their beds, and this dyspnœa is caused, at least partially, by the defective method for renewing the air contained in the sleeping cell.

Not very long ago, a Mexican gentleman who had occasion to travel from Chihuahua to Mexico found this heat insupportable and opened a window close to his bed, with the result that the chill which was thus caused produced an attack of pneumonia which carried him to his grave.

It would be useless to even enumerate the injurious effects of insufficient ventilation; it is enough to point out the fact and to give a slight sketch of the means proposed to remedy the evil.

The drawing which accompanies shows an easy and cheap method of renewing the air in the berths.

A, B, C, D, is an air collecting tube, which is provided at the points A and C with fine wire cloth; the dust which unavoidably penetrates is collected at B, and on opening the trap which I show in the figure is expelled.

The air runs along on the collecting tube, and on reaching the points marked with the letter B, it penetrates the interior of the berths through the vertical tubes D, E, after which it follows the direction shown by the arrows and finally escapes by the ventilator F. At the points E, E, I would place a cock for the purpose of regulating the current of air and for cutting it off when it might be considered necessary to do so.

II.

The possibility of infection in the railroad cars is based on the presence of persons who are affected by the different transmissible diseases, among which I would specially mention eruptive fevers (small-pox, measles, scarlet fever), diphtheria, syphilis, blenorrhagia, tuberculosis, etc.

Sick people travel under three different circumstances: some take their passages in an apparently healthy state, and after a few hours or days, experience the first symptoms of infection.

Others who are evidently suffering from an acute and transmissible disease, hastily undertake a journey in order to be cured or to die in their own home and amongst their own people.

Lastly there are others, who, having acquired a chronic disease, travel with a therapeutic object, that is to say, in search of a different climate, of a bathing station, etc., or for reasons of some other character.

However that may be, the sick travellers temporarily live in common, so to speak, with the healthy travellers; they inhabit the same car, they breathe the same atmosphere, they use the same vessels, and go to the same closets.

It is easy to understand how this temporary intimacy in every way lends itself to the transmission of pathogenic micro-germs; how the bed furniture, the sheets, pillows, matresses, etc., receive the pathological

secretions, the vaginal muco-pus, and all the other bodily emanations which necessarily leave in those articles the seeds of the disease.

The fungi which produce all these micro-germs necessarily fall on the pillows and sheets of the sick person's bed. The diphtheric bacteria (Bacillus Leöffleri) can pass from the natural conduits in which they are lodged, to the bed-clothes; the microbe of tuberculosis, especially when the patient expectorates on the floor and not in the proper vessels, dries and is abundantly diffused throughout the atmosphere, whilst together with the excreta the bacteria of exanthematic and abdominal typhus, as well as other diseases, are expelled in enormous numbers.

It can be easily understood that in this manner and at any given moment a sleeping car can be converted into something very like a lethal hot-house, for the nourishment of the basest and most noisome vegetation and pathogenic deposits.

To mention these evils, is, *ipse facto*, to indicate the imperious necessity of seeking a remedy for them.

In order to lessen as far as possible the dangers of infection, it is necessary to separately disinfect the car itself and all the objects used therein. In order to attain the first object, all the railroad coaches ought to be subjected to a perfect and periodical disinfection, either by means of chlorine vapors or by sulphurous acid; the former undoubtedly ought to be preferred, on account of its excessive germicide powers.

The bed-clothes, towels, etc., not only ought to be changed every day, as is usual, but they also ought to be submitted to a rigorous disinfection every time they are used; in my opinion that object would be attained by submitting them to ebullition in water for an hour, when it is not practicable to sterilize them in an auto-clave or dry-air stove. The closets and cuspidors ought to be washed out with anti-septic liquids, and always be provided with a supply of such solutions.

And lastly, it would be very desirable that, following the example of the provisions of the sanitary code with respect to shipping, a sanitary inspection should be organized for the railroads, providing the principal lines with a hospital wagon which should be dedicated to the use of persons suffering from a disease susceptible of transmission; in this manner the action of the physician would acquire full efficacy and be carried out in a manner corresponding to the important objects of this branch of science.

The above remarks give a slight sketch of the means intended to remedy, as far as possible, the dangers of infection in the railroads. I have considered it my duty not to enter on any great details on this question, in order not to extend this paper to any great length, and especially when I remember that if my observations touch any important point they will most certainly be fully and amply discussed in the special committees of this learned assembly, which are occupied in the study of this important branch of public and international hygiene.

Mexico, 21st of September, 1895.

DISCUSSION ON THE PAPERS ON CAR SANITATION.

DR. J. J. KINYOUN, of Washington, D. C.—There is one phase of the subject with regard to car sanitation which I am very much interested in, that is, the disinfection of cars, and in the five minutes allotted me I think it would be best to devote attention to the Pullman and other sleeping cars. I believe it is a sanitary necessity that Pullman cars should be disinfected at the end of the route, provided that route is over twelve hours. The diseases disseminated through the agencies of these cars—the principal ones—are tuberculosis, diphtheria, perhaps pneumonia and the exanthems; but the two former give us more food for thought than the others. Disinfection of the car can be thoroughly and efficiently done, and at the same time inexpensively, without much injury to it. It should be divided under three heads—the upholstery, the car itself, and the closet. The upholstery should be removed, which can be easily done under the present system, and thoroughly beaten or shaken either by the porter or by compressed air, and afterwards subjected to disinfection. What should be considered an efficient germicide for diphtheria and tuberculosis? We cannot depend upon sulphur dioxide in any volume of strength, even as high as fifteen per cent. It is unreliable, especially when the sputum containing germs is in a dried condition. A great deal of confidence is put in this agent, and I wish to protest strongly against so much confidence being placed in a very unreliable agent. It seems to me, that if we should use it strong enough to eradicate some of the exanthems, we would ruin nearly all the delicate upholstery of the Pullman cars. Is steam applicable for the disinfection of this upholstery? In a certain sense, yes. In another, no. If you have a well-equipped scientific apparatus, and operated by competent, well-trained persons, you can do good work with little or no injury to the upholstery. To trust this work to a $10 porter, under the supervision of a foreman, the Pullman company would abandon it in the first attempt; therefore unless there is some great need for this as, for instance, in case of cholera, small-pox, or an epidemic of one of the contagious diseases which we know exist now and then, we would be resisted in our efforts in putting the articles of upholstery, pillows, mattresses, to steam disinfection.

I have been carrying on for the last three months some experiments in regard to disinfectants for diphtheria and tuberculosis, and the agent which I recommend to you is known as formaline. It has remarkable virtues against the bacillus tuberculosis and diphtheria, and does little or no injury to the fabric. I have tried it upon nearly everything, from a mattress down to fine silk, and there is appreciably no injury done to the material whatever, whether it be dyed with inorganic or organic colors. It is cheap. It has another advantage, the greatest advantage of all, namely, that the diphtheria and tuberculosis germs in the dried state are killed by it. It will kill the germ of small-pox in three minutes. We have in it an agent for surface disinfection that we can absolutely rely on.

The method of applying it. It is exceedingly simple. It can either be applied in the form of fumes or by a special apparatus. For disinfecting large quantities of material, such as come from a Pullman car, I would recommend a simple iron cylinder, which can be closed, to which is attached an iron pipe and steam jet. Another pipe goes with the box containing a lot of cotton batting, absorbent cotton, which has been saturated with the formaline lint. As soon as the chamber is charged the steam jet is set at work under a pressure of sixty pounds. When that is reached the steam cut air permeates through the cotton into the chamber. This is for the purpose of insuring a perfect distribution into the mattresses and pillows, etc. This method can be carried out quickly, and I highly recommend it for the reason that there is little expense attached to it. It is thorough and efficient in the work of disinfection, and one that you can rely upon for small-pox, diphtheria, and tuberculosis. There is one drawback to formaline, and that is its extremely irritating character to the mucous membrane. For instance, in disinfecting a room with formaline vapors, exposing it six to eight hours, it would require thorough aeration afterwards, either by compressed air or steam before the mattresses and pillows could be used again. But that is a mere matter of detail. I should have said at first that the upholstery, cushions, etc., should be so arranged that they can be removed and disinfected the same as mattresses. For my own sake, if I was disinfecting, I would dust the carpets after rather than before disinfection. You will get rid of the formaline at the same time and you do not run the risk that you would otherwise.

As to the disinfection of the car, I think it is best accomplished by dusting first and applying the D'Arsonval spray, which is really a compressed air or spray apparatus consisting of a flexible tube, which in a very few moments will cover the desired surface thoroughly and efficiently, and the spray will penetrate all the corners. A solution of carbolic acid seems to act better than the mercuric bichloride. Why this difference is not known. In the experiments of D'Arsonval it has been shown that an ordinary car can be disinfected by this spray in five or ten minutes. Disinfection of the closets with steam is recommended. Under our present laws diphtheria patients can travel without any hindrance from one state to another. We are called upon to adopt more astringent measures in car sanitation and disinfection than before, when it can be done easily and cheaply, without any material hindrance to the traffic. I think we are called upon to insist that concerted action should be taken by the different railways to put into practice something that will insure to us better health service on trains.

DR. S. H. DURGIN, of Boston.—I would ask Dr. Kinyoun if he has considered the necessity of separating in the upholstered work the wood works from the fabrics in using steam or the other agent which he has spoken of.

DR. KINYOUN.—If you should use a special apparatus for the upholstered work, cushions, etc., it can be disinfected, but if any steam is used

it is out of the question. We cannot use steam on the upholstered material. I do not believe it is applicable as a disinfectant of Pullman cars unless they are so badly disinfected that the question of cost is not considered. I also wish to add that my remarks were general, and not confined strictly to the Pullman car, but the Wagner or any sleeping car.

Dr. Conn (closing the discussion).—I have been much interested in the remarks of Dr. Kinyoun in regard to the use of the new material which he terms formaline, as I have had some experience with it. It is a well known preservative, and like the bichloride of mercury, when dried, produces dust which is irritating to the mucous membrane or any part of animal tissue. That it may be used for the purpose of disinfection there can be no doubt, but it will require a plan of itself, and the thought comes to me that in our work of this kind and our suggestions to the railway managers of this country or any other, we must work in harmony with them, and I have serious doubt whether, as mere theorists, we would be able to present the management of any road with a system which would be practicable. On the other hand, I believe that the mechanic and the sanitarian must work together, and in this way evolve something which will be systematic and easily managed.

I would say in regard to the papers that have been read on car sanitation, that they came in at the last moment and I did not have time to review them. I therefore put them before you, and I am glad I did, for they have proved to be wonderfully good contributions.

REPORT OF THE COMMITTEE "ON THE ABUSE OF ALCOHOLIC DRINKS FROM A SANITARY STAND-POINT.[1]"

Mr. President, Fellow Members of the American Public Health Association:

There is an enemy of human life more fatal than the most dreaded of epidemical diseases, stealthily pursuing, at all times and in every country, its work of desolation and ruin. Epidemic diseases are restricted to certain localities and times, alcoholism knows no bound nor clime, and seems to have baffled, so far, every effort to restrict it.

No more important subject within the range of sanitary science could be brought to the attention of this Association. It affects the dearest interests of man, and strikes at the very vitals of society. Sanitarians, so deeply concerned in the health and welfare of mankind, cannot remain idle in the presence of the daily ravages caused by alcoholism. It is our duty to join the crusade, now carried on in every civilized community against this destroyer of society, which, in the words of Tissot, "does not produce epidemics, but kills in detail, at all times and in every country."

This question of alcoholism is one of the burning issues of the day. Governments and individuals are everywhere in search of the proper measures to eradicate the evils caused by the abuse of alcoholic drinks, to limit its ravages at least. Physicians, clergymen, statesmen, philosophers, and moralists are at the head of this general movement. International congresses, having for object the study of all questions relating to alcohol, have been organized and hold meetings in the principal cities of Europe and America. Temperance societies, temperance lectures—which preach total abstinence rather than temperance—are to be found in every city. In England and in the United States more particularly, the public mind has been greatly agitated on this subject. Most varied and at times most extraordinary remedies have been suggested to restrict the evil. Innumerable scientific works and popular tracts have been published. At this very moment, a "Committee of Fifty," having at its head the Honorable Seth Low, and composed of our most prominent men in science, medicine, and theology, is investigating the question in a most thorough and scientific manner. This committee is divided into sub-committees: a physiological and pathological, a legislative and ethical, and another on the relations of alcohol to poverty and crime. They have laid out a wide plan of inquiry and are energetically pursuing their work. Great results are expected from the researches of this committee.

It would perhaps have been more appropriate for your committee to have postponed this report and waited for the results of the labors and investigations of the "Committee of Fifty." But having been entrusted by the Association with this special report, we have no discretion in the

[1] Presented at the Denver meeting.

matter. Claiming your indulgence, we will endeavor to present the whole subject in an independent and unbiased spirit, in the light of physiology and hygiene. Can we be permitted to hope that, as the smallest stone contributes its humble share to the erection of a grand edifice, so may this report contribute its mite towards the elucidation of this perplexed question of alcoholism?

At the very threshold of this discussion we should clearly understand the meaning of the word alcoholism. This word does not apply, as some of our prohibition friends will have it, to the healthy habit of drinking pure claret wines, beer, or cider at meals, nor even to the occasional, moderate indulgence in pure whiskey or brandy. We take alcoholism to be the result of pathological lesions, occurring in the system from the excessive and promiscuous use of strong alcoholic drinks, whether adulterated or not. The words "excessive" and "use" to be understood in their relative sense, for, with a great many persons of a sensitive and nervous organization, the mere use of alcohol becomes an *abuse*; those should abstain altogether from drinking.

We are of opinion that a great deal of the confusion existing on this question is due to the fact that, in the study of alcoholism, most writers have made but little or no distinction between the properties of alcohol proper and those of wine, beer, and cider, considering them almost equally dangerous, looking upon the moderate consumer of wine and beer as equally criminal as the habitual free-indulger in spirits, including in one word, in the same opprobrium, the abuse of alcoholic drinks and the use of what we consider, in common with many sanitarians, hygienic drinks—confounding the drunkard with the gentleman who drinks his claret at table.

This wholesale condemnation explains, in a measure, the unsatisfactory results so far obtained, notwithstanding the efforts of governments, temperance societies, and individuals. The remedies suggested, the reforms proposed, are too radical, they embrace too much and cannot always be applied. While the habitual use, a fortiori the *abuse*, of strong alcoholic drinks cannot be too severely condemned, the use of pure clarets, or light wine, or beer, or cider, at meals, should rather be encouraged. They contain but little alcohol, 4 to 6 per cent. for beers, 8 to 11 for clarets; they are not merely diluted alcohol, as has been said. Wine contains, besides water and alcohol, diastase, the different acids, tartaric, acetic, and malic, and salts of potash, lime, iron, and sodium, contained in the grape; tannin, extractive matter, oenanthic acid, which gives it its bouquet, etc. Wine and beer are valuable, because of the nutritive material they contain, are pleasant to the taste and readily assimilated; they favor digestion by increasing the flow of gastric juice, and aiding, by their diastase, the conversion of starchy foods. Wine strengthens and cheers without inebriating—"*Bonum vinum laetificat cor hominis.*"

In France and Italy wine constitutes, with bread, the principal food of the workmen of cities and the peasants of the fields. We will see that wine-growing countries, in which pure wine is drunk from infancy and

considered part of the meal, are precisely those in which alcoholism is but little known.

With these reservations in favor of pure wine and beer, your committee joins, heart and soul, the crusade "On the abuse of alcoholic drinks from a sanitary point of view."

Alcohol, as you know, is obtained by the distillation of the fermented juice of all vegetable matter containing sugar—grape, fruit, wheat, rye, corn, beets, potato, etc. It is the intoxicating principle of all fermented drinks. The differences that exist in the various alcoholic liquors are due not only to the amount of alcohol they contain, but to the substances from which the alcohol is derived. Bourbon whiskey, for instance, is made of corn and malt; rye whiskey, of rye and malt; brandy, of wine; rum, of molasses; arrack, of rice. The quantity of alcohol in these different liquors varies from 40 to 60 per cent. Of these, French brandy, or cognac, when pure, is the less objectionable on account of its containing only ethylic or vinous alcohol, the less toxic of all alcohols. Its peculiar taste and aroma are due to a volatile oil derived from the husk of the grape. Brandy contains, besides coloring matter, tannin, oenanthic ether, etc. Next to brandy, pure old Bourbon is the less objectionable.

The physiological and pathological effects of alcohol, without adulteration, vary greatly according to the source from which it is derived. The least toxic is ethyl alcohol, from vinous fermentation; the most toxic is the amylic alcohol, or potato spirit, which contains the deadly fusel oil in large quantities. Dujardin-Beaumetz, Rabuteau, and others have demonstrated experimentally that it takes 8 grams of ethylic alcohol per one kilo of an animal's weight to produce the death of that animal in twenty-four hours; while 4 grams of propylic alcohol, 2 grams of butylic alcohol, and only 1.70 grams of amylic alcohol per kilo of the animal's weight will kill him in a very short time. These experiments determine physiologically the relative toxic degree of the different alcohols.

Experience teaches us that alcohol, such as exists in wine, is much less injurious than that obtained from the fermentation and distillation of grains, beets, or potatoes. All these grain alcohols contain a certain amount of the deadly amylic alcohol. Ethylic alcohol produces the characteristic lesions of alcoholism (liver and kidney disorganization) only after long, habitual excesses, after causing frequent intoxication; the amylic produces primarily (d'emblée) those characteristic lesions and sometimes kills without preceding drunkenness. We have said that alcoholism is unknown or much less common in countries where wine from the grape is manufactured extensively than in countries where no grapes are grown. In fact, it is in Northern Europe and in our own states, where no grapes or very few vines are cultivated, that alcoholism prevails most extensively. It does not, or hardly, exist in the south of France, Spain, Italy, and Greece, where the grape is extensively cultivated and wine is the chief beverage. One of your committee lived six years in different parts of Italy and never saw a dead-drunk man in the

streets or in the *osterie*. Official statistics in France prove that in those departments in which no wine, or wine alcohol, is made, but which consume exclusively industrial alcohols, the individual and social effects of alcoholism are much more noticeable than in the wine-growing departments. In small doses alcohol acts like a diffusible stimulant, rendering service as such in therapeutics. In larger and repeated doses it becomes a narcotic and anaesthetic; it retards assimilation, favors granular and fatty degeneration, and produces in the long run the characteristic lesions of alcoholism in the blood, brain, nervous system, liver, stomach, heart, and kidneys. According to many writers it does not possess any nutritive qualities, as it passes through the system without combining with the blood and tissues, and is rapidly eliminated by the lungs, skin, and kidneys. Others consider it as an article of food, maintaining that the larger part of the alcohol ingested is burnt in the economy. Experiments of Dujardin-Beaumetz and others seem to prove that alcohol does undergo transformation in the system and acts as a respiratory food, increasing vital energy and restraining waste. In either case the retarded assimilation which it undoubtedly produces causes in the long run a disturbance in the normal functions and structure of histological elements.

The abuse of alcohol produces a slow and insidious poisoning, which inexorably leads man to premature death after ruining his health and perverting his intellectual and moral faculties. Alcoholism is one of the potent factors in the promotion of crime, misery, and suicide; it causes the ruin of the individual and of the family, the degeneration of the race; it peoples hospitals, penitentiaries, orphan and insane asylums. Its deleterious influence is felt through successive generations under the form of epilepsy, insanity, and general degeneracy. At the Saltpetriere, in Paris, Dr. Martin found that in 83 epileptic children, 60 were born of drunkards! Sixty families gave birth to 300 children, of whom 141 died in early infancy and 60 were epileptics; one fifth only of the 300 were healthy.

But it is not necessary for us to dwell long upon this subject; it is but too familiar to us. Every day can we see on the streets of our cities hundreds of walking phantoms, victims of alcoholism. While in other countries this dreadful habit of drinking is mostly confined to the lower and poorer classes, with us, unfortunately, we find it to exist extensively among our better classes. Professional men, writers, and merchant-kings are not exempt from it. Many of our most remarkable men in politics, men of national reputation, are addicted to the use of alcoholic drinks. Distinguished families have been swept away by the terrible scourge. It seems to be the national vice of America. In our cities bar-rooms and saloons flourish at every corner. Grog-shops spring up in every little village, on the prairie, in the wilderness. In the remotest mining camp is to be found a "gin-mill" with all its debauching influences. In new communities, long before the church or the school is built, the corner grocery, with its accompanying drinking-stand, is thrown

open to the public. Our country is the only one in which people high and low drink while standing, without eating, without being thirsty, solely to be sociable. Here flourishes the habit of treating all around, until every one of the sociable party has paid his turn, that is, until half a dozen or more drinks have been absorbed, always standing, in an incredulously short space of time. In no other country is the art of the micologist so far advanced. Here are daily served over the counter a thousand and one different drinks of the most alluring and tempting nature.

Prohibition parties in politics, temperance societies and missions, total abstinence religious societies, Keeley Cures and other "drink cures," the numerous sanitariums for the alcohol and morphine habits, and other similar organizations are distinctly American institutions. They prove conclusively that there is more drunkenness here; that all such reformatory institutions are more needed here than elsewhere. The Anglo-Saxon race seems to be more inclined to drinking than any other. This fact cannot be explained by climatic influences. Americans drink in the North as well as in the South, and England, Scotland, and Ireland have about the same climate as Northern Germany and the north of France where drunkenness exists to a considerable lesser degree.

Americans going to Europe carry their drinking habits with them. For their special benefit American bars and American drinks have been introduced in almost every city of Europe. Germans, Frenchmen, and Italians settling in America seldom contract the drinking habit, and continue the daily use of their wine or beer at meals.

We physicians know but too well that the pernicious habit of drinking has within the last few years greatly increased among women. Many society ladies indulge now-a-days in their daily whiskey-toddy and mint-julep. The "*fin de siecle*" woman's ambition is to ape man even in his vices.

In spite of the fact that alcoholic drinks have been in use from time immemorial among all the nations of the world, it is but recently, within the last fifty years, that the bad effects of alcohol have been particularly noted. Diseases due to alcoholism are undoubtedly of a more serious character now-a-days than formerly. Could not this fact be, in a measure, explained by the gradual disappearance of pure wines and liquors and the substitution in their place of inferior, adulterated, toxic alcohols?

For a number of years there was no real wine made in France and Italy; the wine was threatened with complete destruction by the prevalence of the oïdium and phyloxera. Had it not been for the importation and grafting of the robust, healthy young vine from America, which alone resisted the disease, all the old vines of those countries would have perished. This happened just at a time when, thanks to increased facilities of transportation, the wine industry had considerably extended everywhere. The diminished production of pure wine and alcohols, and the consequent increase in the price of these products, gave rise to new and criminal industries. It stimulated the greed of men ever ready to

sacrifice the dearest interests of humanity to their own selfish, pecuniary advantage. It was then that the various poisonous wine bouquets and essences were introduced, that cheap, inferior, toxic alcohols, manufactured from almost any vegetable when not manufactured directly by synthesis in the chemist's laboratory, began to flood the market. They were added to wine and beer to strengthen them so that they could be better exported; they were converted by skilful manipulation into innumerable drinks, or "*liqueurs*," as pleasant to the sight and taste as they are dangerous to life. Wines were made having no relation whatever to the natural product of the vine. It was about that time that the "green monster," absinthe, introduced in France by army officers from Algeria, began to be popular.

By the addition of these poisonous compounds, the already pernicious effects of alcohol were increased a hundred fold, giving rise to a new form of intoxication, described by some under the name of "convulsive drunkenness." Its deadly effects are more especially manifested on the nervous system, producing violent delirium, hallucinations, and aggressive anger, awaking the worst passions, reducing man to the condition of a savage beast, causing atrocious crimes, and leading almost invariably to the lunatic asylum or to the gallows.

This condition of things accounts for the frightful extension of alcoholism, and explains its ever increasing ravages. Official statistics in England, France, and Switzerland show an increased consumption of alcoholic drinks out of all proportion to the increase in population. They also clearly point out a marked increase in the number of deaths and mental alienations caused by alcohol, and also in the number of crimes committed by individuals in a state of acute intoxication, or affected with chronic alcoholism. Furthermore, in continental Europe, where large permanent standing armies are maintained, every citizen being a soldier, statistics have been published showing an increased number of exemptions from military duty due to alcoholism, acting indirectly through hereditary influences. We are not aware of such statistics in our own country. If to the figures obtained from the European statistics we should add the vastly increased number of suicides, of still-born children, the large mortality in infants, the squalid poverty observed in all large centres, in all of which conditions alcoholism plays undoubtedly an important part, we can form an approximate idea of the ravages caused by this curse of humanity, a thousand times more fatal, we repeat, than all epidemical diseases.

In presence of this rising tide, which seems to threaten society in its very foundation, what are we, sanitarians, to do? What remedies has science to suggest, if not to eradicate, at least to limit, the evil? Governments, associations, and individuals should join their efforts and co-operate in this great work. Each has special duties to perform. No consideration of personal liberty, of freedom of trade and industry, should deter constituted authorities, national, state, and municipal, from adopt-

ing most stringent measures. Thousands of our citizens,—men, women, and children,—are threatened in their most sacred interests. The scourge which fills hospitals, asylums, and penitentiaries, and brings on death and ruin to the innocent, appeals directly to the sympathy of government and calls for its strong-handed intervention. There can be no too severe punishment for those who knowingly jeopardize the health, honor, and life of our people. *Salus populi, lex suprema.*

The national government should have supervision of alcoholics and insure their purity from the time they are manufactured to the time of their sale to the consumer.

We propose, among others, the following measures:

1. To greatly increase taxes and duties on alcohols.

2. To impose severe penalties on all adulterations and falsifications of the same. To require, as far as practicable, the rectification of all alcohols.

3. To greatly diminish, or totally remove, taxes and duties on wine, beer, cider, and coffee, so as to facilitate their use and render them accessible to the poorest.

4. Total prohibition in communities composed mostly of ignorant and vicious classes, such as the immediate neighborhood of large manufactures and those agricultural sections in which the negro element prevails extensively.

5. Very high city licenses, in order to diminish the number of bar-rooms and saloons, and secure better quality of drinks. Licenses to be granted only to persons having a certain amount of responsibility.

6. Enforcing the strictest sanitary inspection of drinks sold over the counter.

7. Encouraging and promoting the culture of the grape in those of our states whose soil and climatic conditions are favorable to its growth, and favoring the making of pure, natural wine. The day California, Ohio, and other of our states will furnish an abundance of pure grape wine, and wine-drinking will become general in the United States, alcoholism will disappear from our midst.

8. Drunkenness should receive the highest penalties of the courts; the person who sells, or gives, intoxicating liquors to a minor or a drunkard should be as severely punished. The man who habitually gets drunk should be made to work, instead of lying idle in a prison cell or paying a fine.

Individual efforts, the intelligent workings of society, can do even more than governments. One of our first efforts should be to improve the material and moral condition of the workingmen. It is hardly necessary to say the first requisite every where—a *sine qua non*—is an abundance of pure water. The unsanitary condition of the slums and poor sections of large cities undoubtedly induces or favors drunkenness. Many drink because they are not fed, or improperly fed, many drink to deceive

hunger and drown their sorrows. Poverty and drunkenness form a vicious circle, being at one time cause and effect.

Societies on the co-operative plan should be established to secure cheap and clean lodgings and wholesome food. Popular kitchens should also be organized, where cheap meals would be sold and the art of cooking practically taught at little or no expense to the people. We should encourage the introduction among us of the French and Italian cafés and German beer gardens where hygienic drinks and strong black coffee are the principal beverages offered to the public.

Let us endeavor to procure to the working-classes healthy recreation and amusements. Give them parks and gardens in their own tenement districts, as New York is now doing, where they may enjoy music and dancing under proper restraint; theatres, where moral and patriotic plays will be presented; gymnastic games, instructive lectures on hygiene and temperance rather than prohibition. At all such amusements the whole family could properly accompany the husband and father, thereby securing proper decorum and respectability. We are heartily in favor of temperance, that is, moderate drinking, but opposed to prohibition, or total abstinence, which experience, so far, has proved to be unrealizable. Temperance, as understood by us, can only be obtained by moral education, not by compulsion.

We have more faith in the efficacy of such measures as we propose than in that of the radical extremes of so-called temperance societies and the spasmodic and inefficient enforcement of the Sunday laws. These laws, in most instances, are only carried out on the surface; they discriminate between classes of tradesmen entitled to equal rights and privileges, and often prove to be a source of serious inconvenience, of true hardship to the public. We cannot forget our disappointment, to say the least, at finding even the drug-stores of Kingston, Canada, closed on a certain Sunday morning, when we were in search of a much needed medicine. Sunday laws, when strictly enforced, become a perfect nuisance, clogging the wheels of social life; when not uniformly enforced, they develop hypocrisy and deceit, adding one vice to another. The wide front door is closed, but the back door, or side alley-gate, remains surreptitiously opened. We do not believe in intermittent, once-a-week virtue and honesty.

There is a prophylactic measure against alcoholism mentioned by us, which, on account of its apparent irrelevancy, needs elucidation. We refer to the establishment of cooking schools for the people, from which, we are convinced, great results may be derived. There is no denying the fact that our national cuisine is poor, and that Americans in general have but imperfect notions of the culinary art and do not know how to eat intelligently, notwithstanding the fact that our markets abound with the best of everything. We boil and fry too much: not enough soup and too much pastry and pie. We eat too often, at too short intervals, not granting sufficient time for digestion. Our meals are composed of too

many different dishes of heterogeneous nature and as they are generally badly seasoned, every one is expected to complete the seasoning in his own plate, by the addition of fiery sauces and condiments. Nay, more, these badly cooked and unsavory dishes are swallowed in a hurry, hardly masticated, and washed down by large quantities of ice cold water. Wine (claret) is hardly ever used at meals, even among our best people.

We contend that bad cooking, hurried and unpalatable meals, the extravagant use of ice, are conducive to drinking; they create a thirst, a craving for strong drinks after meals, with a view of aiding digestion, and in the long run will surely produce dyspepsia, which itself leads to drinking.

We have advocated as a means of offsetting the American bar-room, the establishment of cafés such as exist in all Continental Europe. This may at first seem strange to a purely American mind, but will certainly be understood by those who have visited Europe. In those cafés, if you except absinthe or vermouth, taken before dinner, there are hardly any alcoholic drinks served. There is no bar, or counter, where one gobbles down a "drink" while standing. Cafés are frequented by the best people, by ladies whose presence exerts a controlling, refining influence on the rougher sex. There, in superbly decorated and ornamented parlors, or, in summer, around innumerable little tables, on the side-walk, in front of the establishment, comfortably sitting in the company of friends, one may indulge in a pleasant social chat and enjoy "con gusto" his "consummation," which generally consists of a cup of coffee, a glass of wine or beer, a "mazagran," an ice cream, a lemonade, or a "sirop de groseille" with seltzer, their soda-water. The restaurant proper is entirely separate. In those cafés one finds the daily papers, illustrated magazines, stationery, etc. In some cafés chess and checkers are played. A gentleman can there spend a few moments as in his own club, at a trifling expense. Cafés were first introduced in Europe at Venice, over two centuries ago, from the Orient. In Italy they are even more luxuriously and artistically decorated and cheaper than in France. They are frequented by all classes, the clergy included. Persons of the same profession or training often meet at a special café, which for them is a place of rendez-vous, a sort of headquarters. Compare these cafés of Paris and Florence, or the beer gardens of Vienna or Berlin, around whose tables sit "paterfamilias" and his whole family, with the American bar-room or saloon.

We would like to see the use of strong, black coffee more generalized in our country. Coffee is a sort of antidote to alcohol. In countries which consume the most coffee, such as Turkey, the Orient, and Brazil, alcoholism is unknown. Coffee is the best of stimulants. It does not have the secondary depressing effects of alcohol. Of delicious taste and most agreeable flavor, a strong infusion of pure good coffee constitutes, by its hydro-carburetted elements, a powerful respiratory beverage. It facilitates the digestive functions, stimulates circulation and the nervous

system, especially the cerebral faculties. Brain workers and thinkers are great amateurs of coffee. There seems to be a physiological antagonism between coffee and alcohol, as well as between coffee and opium. It acts as an antidote to those two powerful toxics. Coffee drinkers seldom indulge in alcoholic drinks. The habitual use of coffee we consider as a prophylactic against alcoholism. We might add here that it is a good anti-malarial agent.

In conclusion, we repeat, there is no more important, no more vital question in the whole domain of sanitary science, than this question of alcoholism; none more worthy of the attention of this Association. We solicit your active co-operation in the study of the great problem we have laid before you. A complete reform in the habits and customs of a country is undoubtedly difficult to expect, and can only be realized after years of the best directed efforts to enlighten the people.

Your committee has endeavored to present to you the whole question, from a purely sanitary and physiological standpoint, and in an unbiased and liberal manner. We may be permitted to hope that some of the measures proposed by us will have a salutary influence towards arresting the ravages of alcoholism, that scourge of society.

FELIX FORMENTO,
C. O. PROBST,
E. P. LACHAPELLE,
Committee.

MEASURES WHICH OUGHT TO BE ADOPTED FOR LIMITING THE CONSUMPTION OF IMPURE ALCOHOL AS A BEVERAGE.[1]

BY PROF. JOSE DONACIANO MORALES, Mexico, Mex.

Gentlemen:—Delegated by the important and historical state of Oxaca, in the Mexican Republic, a state that has been the cradle of the most illustrious men who figure in the history of Mexico, among whom is the one who has in so short a time brought about the most important developments in my country, who has elevated it to the level of the most cultured nations, I ought to decline the honor of addressing this assembly, among which are men who ought to be measured by the fame they have reached through their learning, especially if I were governed by my own knowledge of my insufficiency and not by the good will and the desire that I have of corresponding by my efforts, to the confidence that without any merits of my own has been placed in me by the government which has appointed me its delegate.

Confiding, therefore, on your benevolence, I will attempt to develop a theme that certainly must preoccupy all students of hygiene, and that only requires to be announced with a few of the ideas which have been suggested to me by its importance, to secure the attention of this Assembly and to be discussed as could be expected from the presence of so much learning.

I desire to call your attention to the desirability of bringing before the legislatures of all countries here represented the urgent necessity of actively prosecuting the sales of alcoholic drinks of bad quality, or that contain impurities of a certain class, and to which we owe the greater part of the ravages brought about by that social cancer which is called alcoholism.

Like the strong and jealous God who is spoken of in sacred scripture, a God who visits the sins of the fathers upon the children, even unto the third and fourth generation of those that hate him, in the same manner does alcohol carry its pernicious effects, and even further yet in the descendants of those who deliver themselves up to the immoderate use of alcoholic libations.

I do not now propose to detain you in listening to a demonstration of the indisputable truth contained in the above sentence. Innumerable cases are found in the clinics of wretched beings to whom their ancestors have bequeathed, by way of sole inheritance, the same want of vigor and of health, which is felt by the degenerated beings which gave them life. The statistics collected by Professor Denne, physician of the Infant Hospital of Berne, show a rate of mortality among the children who are

[1] Presented at the Denver meeting.

born of alcoholic parents, which is two and a half times greater than that among the children of healthy individuals, and a number of epileptics, which reached twenty-five per cent. among the children of the former class, while the statistics collected by Dr. Legrain, which refer to 215 alcoholic families observed, show fifteen per cent. of premature deaths with eleptiform sufferings, and eighteen per cent. of mental alienation. Such are the well known ravages of alcoholism among the descendants of vitiated people.

But it is not my present intention to speak of the pernicious effects of alcoholism in general, but rather to call attention, by means of this work, and to attempt to demonstrate that if alcohol, considered as a defined chemical product, $C_4H_6O_2$, in a pure state, is to be blamed through its abuse for the effects of alcoholism, the greater part of those effects really is to be attributed to the allied chemical products, alcohols of a high equivalent, aldehydes, furfurol, and still more to the product denominated fusel-oil, which by its peculiar action is more destructive even than pure ethylic alcohol. These products, which are contained in the inferior alcohols of commerce, are capable of being eliminated, and the ravages of that liquor can therefore be considerably reduced. In the head and tail products, as they are commonly called in the art of distillation, are found the most injurious and far-reaching enemies of the system, and it is against these that I desire to employ the powerful resources of this learned assembly.

The studies of Dujardin, Beaumetz, and Audige, in the investigation of the poisonous doses of the different alcohols, following the steps of Pelletan and Furster, who had only studied the amylic and butylic alcohols; of Gross, Richardson, and Rabuteau, who formulated a law showing that the toxine qualities of a soluble and diffusible alcohol are in direct proportion to the degree of concentration expressed by C_nH_{2n}, which enters into its constitution, present a summary, respecting the alcohols of commerce and shown in the following table, which designates by a numerical expression the different doses of those liquors, which have toxine properties. These numbers have been obtained by experiments per kilogram of warm-blooded animals, and the operative part has been carried out by introducing it into the system in a hypodermic way.

Nature of the Liquids.	Toxic Dose. grams.
1. Alcohols and spirits of wine	7 50
2. Pear brandy	7 35
3. Brandies made from cider and residue of grape	7 30
4. Alcohol and brandy made from beet root	7 20 to 7
5. Alcohol and brandy made from grain	6 15 to 6 96
6. Alcohol and brandy beet root syrup	6 90
7. Alcohol and brandy, potatoes	6 90 to 6 80

This table shows us the degree of toxic properties pertaining to each one of the classes of alcohol which are there enumerated, and which are in direct proportion to the degree of impurity contained in each, or other-

wise in proportion to the fusel oil which is formed by the amylic enantylic and propylic alcohols.

Once we recognize the toxic qualities of high grade alcohols as greatly superior to those that pertain to pure ethylic alcohols, we must bear in mind, in studying their after-effects, through the daily use of the alcohols containing such impurities, that these liquors of high equivalent are eliminated with much greater slowness than ethylic alcohol, for which reason their effects are more lasting.

The chemical industry of producing alcohols free from grain, after saccharification by means of acids, ought to be considered as one which has given rise to the presence of the most injurious alcohols in commerce, as this method of distillation produces liquors extremely rich in fusel oil, furfurol or pyromusic aldehyde, and therefore are the most injurious of all. It is, therefore, the part of hygiene, besides procuring the decrease as far as possible of alcohol as a beverage, to prevent the consumption of impure alcohol.

Attempts have been made in Germany to fix the maximum proportion of fusel oil that can be tolerated, a proportion that ought never to go beyond 1 per 1000; but Baer goes further yet, in my opinion with great justice, and declares that all alcohol which is intended for consumption ought to be absolutely pure, and free from fusel oil.

In the crusade which must be taken against the use of impure alcohol, it will naturally be necessary to overcome serious difficulties, these being principally attributable to the rooted tastes on the part of the public, for the flavor of certain drinks, the use of which has become a popular custom; and, on the other hand, it would be necessary to overcome the resistance which will be imposed by the distillers of these liquors, on finding that their enormous interests are exposed to injury.

The recent advances in the distilling industry, thanks to the scientific study of fermentation, and the improvements in the construction of the apparata, fortunately allow of great improvements in all the products which originate in fermentation. As in zootecnics, we have been able to attain the production of magnificent animals of the best classes that man breeds, so likewise in the industry of producing pure liquors by fermentation we have now a source of wealth, both in the production of the elements of fermentation as well as in the quality of the product obtained by their use. If, on the one hand, we know the good results obtained by the employment of pure leavens, let us encourage its use, and hygiene will profit by the decreased toxic capacities of the alcohols thus distilled; but if, on the other hand, we are aware of the evil effects on the quality of alcohol resulting from the saccharification of grain by means of acids, let us prevent its production as far as possible, and in any case prohibit the public sale of alcohols which may not be perfectly purified in the magnificent stills of the latest models which are now employed in this industry, even should the special flavor of many of them be injured or lost, and even should some of them be retired from the market.

The regulation of fermentation by the cultivation of pure yeast is such a well-established fact that, as is well known, the manufacturer can now produce at will, with the same basis, beverages of different flavor by sowing different saccharomyces, and a study of this subject has now explained to us why it is that certain alcohols have properties that are up to a certain point hygienically, showing us that a due attention to the previous fermentation has produced one of the least impure liquors.

An example of these good results in the production of alcohol charged with the smallest proportion of impurities, is found in the preparation of wines, by reason of the care which is taken by the producer, although empyrically, to preserve the fermented products as pure as possible. I can cite another example taken from one of the industries of my own country. In several states of the Federation, large quantities of a spirit called "mescal" are prepared, which in the state of Jalisco are known under the name of "Tequila," a drink that is even recommended as medicinal. This drink is extracted from the "agave," whose leaves and stalk are submitted to a highly elevated temperature before extracting the juice they contain, in this manner developing certain pyrogenated products, which, acting as antiseptics, kill the greater part of the secondary fermentation; the result being a liquor which, although certainly containing those same pyrogenated products as impurities, amongst which is found pyridine, is always much purer than the alcohol of sugar cane which is produced by imperfect and complicated fermentations carried out in a routine manner in the centres of production, where as yet the advances in bacteriology and industry have not arrived with their beneficent action. As can be understood from the above, the distillation of mescal has reached, in a casual manner, like the preparation of wine, a comparative purity in its products, due to a certain method of fermentation.

If, therefore, it is now possible to conduct the fermentation with the exactitude with which a chemical operation is carried out, and if, on the other hand, the sub-divided and industrial distillation permits the production of alcohol of excellent quality, it is in my opinion that we can greatly diminish the effects of alcoholism, by enacting laws which will strictly prohibit the sale for drinking purposes, of alcohols that do not fulfill the conditions of purity laid down in those laws. It would be easy to establish for either government or private account, houses for the rectification of alcohol, which might be sources of revenue for the public funds. Besides this, inspection offices ought to be established, both in the ports and on the frontiers of any nation, as well as in the localities where the liquor is consumed, prohibiting the sale of all liquor with a certain grade of impurity.

There are different processes for deciding whether a liquor does or does not fulfill the acceptable conditions of purity. The action of concentrated sulphuric acid on an equal volume of alcohol and the subsequent action of heat on this mixture, produce colors whose tints, to a cer-

tain extent, vary in proportion to the impurities; and in this we have an easy means of detection. The investigation of aldehydes by the darkness which is produced by a concentrated solution of potash in a state of ebullition in commercial alcohol, provides another easy method of deciding the impurity of that alcohol which, together with the previous one, furnishes means of forming an opinion on the character of this liquid. This method would be more complete if the tail alcohols were tested by means of the light bicarburets, which are collected or separated from the alcohol when, after being agitated together with the latter, the mixture is diluted with water. Sulphuric acid will afterwards produce the yellow or brown color in the hydrocarburet, and according as the impurity of the sample may consist in isobutylic or amylic alcohol.

Consequently, the production of alcohol as a beverage, whatever may be the measures taken to prevent its ravages, and as already proposed in Mexico by my learned companion, Dr. Nicolás R. de Arellano, can still be made the object of laws, which, by improving the quality from a hygienic point of view of the alcohols which are put on the market, and actively proceeding against all those which do not fulfill the conditions that may be specified, will contribute to diminish the disastrous effects which, as before stated, result from the abuse of alcohol.

In view of the above, I beg leave to propose to this learned association, that measures be taken to obtain the following improvements:

I. An improvement in the quality of the alcohols; requiring that those which are used as beverages should always be produced by means of pure fermentation, to the exclusion of saccharification by means of acids.

2. That these same products should not be taken out of the distilleries until they have been purified in the most perfect manner.

3. That a severe vigilance should be exercised, with a view to preventing the public consumption of all the alcohols which have not the necessary degree of purity.

Such, gentlemen, is what I consider of the greatest interest, with a view to protecting the public which uses alcoholic products against the danger of poisoning, because if these liquors are in themselves injurious on account of the alcohol contained, still more so are they through the impurities with which they are charged. By this means we will also considerably diminish the consumption of alcohol as a beverage, on account of the increase in price, and consequently we will have a decrease in alcoholism, which is the origin of innumerable evils to humanity.

OFFICIAL REPORT OF THE PROCEEDINGS OF THE TWENTY-THIRD ANNUAL MEETING OF THE AMERICAN PUBLIC HEALTH ASSOCIATION.

HELD IN DENVER, COLORADO, OCTOBER 1, 2, 3, AND 4, 1895.

TUESDAY, October 1st, 1895.

FIRST DAY.—MORNING SESSION.

The Association convened in the assembly hall of the Brown Palace Hotel, and was called to order by the President, Dr. Wm. Bailey, of Louisville, Ky., at 10:30 A. M., who said: The Association is to be congratulated upon meeting in the city of Denver in its twenty-third annual meeting. I will have something further to say to you to-night when I deliver my address, hence I will not detain you with further remarks. We will now listen to the report of the local committee of arrangements, Dr. Henry Sewall, of Denver, chairman.

DR. SEWALL said:—In behalf of the local committee and citizens of Denver, I bid you a hearty welcome. These annual gatherings afford an opportunity for personal intercourse and the interchange of ideas, and although the attendance is small at this, the first session, we shall hope to make up in value of material what we lack in numbers. You are all invited to make free use of the time and knowledge of everyone wearing a committee badge. The other badges are for the members, so that you will have no difficulty in recognizing them. You will notice the badge consists of violet and gold ribbons joined together with a hollow silver brick. Violet is typical of the state flower, the columbine, and the gold is an exhibition of courtesy to the Eastern members, generally known as gold bugs.

As to the program, the important features of it are as yet unsettled, and we need your co-operation to enable the local committee to be definite in statement.

You know that there will be an open public meeting in Trinity church at 8 P. M. this evening. Seats will be reserved for the members to the extent of 130, or as many more as will be necessary.

An opportunity will be given to you to inspect the smelters, the managers of which have kindly extended the courtesy of their premises; but we hardly feel that we can set an hour for such a trip which will consume about three hours, lest it interferes materially with the legitimate business of the meeting. But if the Association will decide upon the number of members who would like to visit the smelters at any hour, an arrangement can be made to do so.

On Wednesday afternoon, Mrs. Hill, wife of ex-Senator Hill, invites the lady visitors to an afternoon tea at her residence. A public scientific meeting will take place in Unity church on Thursday evening.

On Thursday afternoon the members and their guests will meet at the entrance of this hotel and take the tramway cars for a ride around the city and suburbs. The trip takes about three hours.

On Friday afternoon at 1:30, we will meet at the Union depot and take a special train to the Georgetown loop, returning to the city about 9 P. M. If the moon serves us well, we will have a beautiful view of the cañon.

It is proposed Saturday morning to take the train for Colorado Springs and Manitou, where the citizens will meet us, and when trips can be made to the Broadmoor Casino, Cheyenne Cañon, the Garden of the Gods, Pike's Peak, etc.

THE PRESIDENT.—The next thing in order is the report of the Executive Committee.

THE SECRETARY.—The only report I have to make at this time is that the names of 60 applicants have been submitted for membership and recommended by the Executive Committee. (Names read.)

DR. FELIX FORMENTO.—I move that the secretary cast the ballot of the Association for the names read. Carried.

The secretary then did so, and they were declared duly elected.

The secretary read a telegram, dated from Chihuahua, from the Mexican delegation, stating that owing to a washout on the 29th of September, it prevented them from being present at the opening session, but that they would arrive the following morning.

The reading of papers was next proceeded with. Dr. Josiah Hartzell, of Canton, Ohio, read a paper entitled "The Mississippi River as a Sewer."

Dr. Peter H. Bryce, of Toronto, followed with a contribution on the "Pollution of Water Supplies."

The two papers were discussed jointly by Drs. Wende, Cantwell, Guilbert, Bailhache, Patterson, Kinyoun, Formento, McCormack, Lewis, Probst, Cook, Mr. Hering, and in closing by Dr. Bryce.

DR. MCCORMACK.—In accordance with the suggestions offered in the paper of Dr. Bryce, I move that a committee of three be appointed by the chair (with Dr. Bryce as chairman) to bring the matter before the Association in more suitable form. Seconded and carried.

The next thing in order was the reading of the report of the Committee on Animal Diseases and Animal Foods, Dr. D. E. Salmon, of Washington, D. C., chairman. In the absence of Dr. Salmon, the report was read by Dr. Chas. N. Hewitt, of Red Wing, Minn.

The report was discussed by Drs. Bailhache, Weidner, Hewitt, Kinyoun, Avery.

Dr. Mitchell offered a resolution, which was referred to the Executive Committee :

WHEREAS, An order of the postmaster general prohibits the use of the mails for the transportation of diseased tissues, and

WHEREAS, Specimens suitable for bacteriological examination can, when enclosed in proper packages, be transported in the mails without endangering the health of persons who may handle them, and without risk of contaminating other mail matter, and

WHEREAS, Bacteriological examinations in cases of tuberculosis and certain other infectious diseases constitute an invaluable defence against the spread of pestilential affections by providing an exact method for early and acurate diagnosis, Therefore be it

Resolved, That the American Public Health Association hereby respectfully requests the postmaster generals of the United States, Canada and Mexico, to so modify the orders now in force that specimens of diseased tissues, when properly enclosed in approved mailing packages, may be admitted to the mails for transmission to state and municipal laboratories.

On motion, the Association adjourned until 2:30 P. M.

AFTERNOON SESSION.

The Association reassembled at 2 P. M., and was called to order by the President.

Mr. E. C. Jordan, C. E., of Portland, Me., presented a paper on "Car Sanitation," which was read by Dr. Young, of Maine.

Professor S. H. Woodbridge, of Boston, contributed a paper on "The Ventilation of Railway Coaches," which was read by Dr. Durgin, of Boston, in the absence of the author.

A paper "Relating to Car Sanitation," was contributed by Dr. Domingo Orvañanos, of Mexico, Mex., which was read by Dr. C. O. Probst, in the absence of the author.

Dr. Granville P. Conn, of Concord, N. H., chairman of the Committee on Car Sanitation, followed with his report.

These papers and the report were then discussed jointly by Drs. Kinyoun, Durgin, and in closing by Dr. Conn.

On motion, the Association adjourned until 8 P. M.

EVENING SESSION.

The Association was called to order at 8 P. M., in Trinity church, by the President.

After the rendition of two musical selections by Dr. John H. Gower, the President introduced as the first speaker of the evening the Hon. A. W. McIntyre, Governor of Colorado, who welcomed the Association to the state.

The Governor was followed by an Address of Welcome to Denver by the Hon. T. S. McMurray, mayor of the city.

Dr. Conn, the First Vice-President, then took the chair, and President Bailey delivered his annual address.

The presidential address was followed with remarks by Chancellor McDowell.

On motion, the Association adjourned until Wednesday 10 A. M.

SECOND DAY.

WEDNESDAY, October 2, 1895.

MORNING SESSION.

The Association met at 10 A.M., and was called to order by the President. The chair asked for announcements by the local committee of arrangements, but there were none.

THE PRESIDENT.—We will now listen to the report of the executive committee, which will be read by the Secretary.

THE SECRETARY.—Mr. President, the resolution offered yesterday by Dr. Mitchell, of New Jersey, and referred to the executive committee has been considered by that committee, and they recommend its adoption.

DR. LISTON H. MONTGOMERY.—I move the adoption of the resolution. Seconded.

The resolution was discussed by Dr. Swarts and Dr. Mitchell, and then adopted.

Several samples of tubes and cases for the transmission of pathological specimens were exhibited by the author of the resolution.

DR. SEWALL made further announcements regarding the proposed trips previously referred to.

THE PRESIDENT.—We will listen to a report of the Executive Committee by the Secretary.

THE SECRETARY.—Mr. President.—At the last meeting of the Association the Committee on the Centennial of the Discovery of Vaccination was dropped from the list. The Executive Committee have duly considered the subject and recommend that this committee be restored.

DR. HORLBECK.—I move that the recommendation of the committee be adopted. Carried.

THE SECRETARY.—The Executive Committee recommend the creation of a new special committee entitled "Committee on the Relation of Forestry to Public Health."

THE PRESIDENT.—What will you do with this recommendation?

DR. MONTGOMERY.—I move the adoption of the recommendation. Carried.

THE SECRETARY.—I have a few applications for membership which have been examined and recommended by the Executive Committee.

THE PRESIDENT.—What will you do with these applications?

DR. FORMENTO moved that the Secretary cast the ballot of the Association for the election of the new members whose names were read, which the Secretary did, and they were declared elected.

THE PRESIDENT.—The next order is the reading of the Treasurer's report.

The report was read by the treasurer, Dr. Henry D. Holton.

DR. DURGIN.—I move that the report be received and referred to an auditing committee. Carried.

THE PRESIDENT.—I will appoint as an auditing committee Drs. Gray, Horlbeck, and McCormack.

Dr. C. N. Hewitt, of Red Wing, Minn., offered the following resolution:

Resolved, That this Association has heard with profound sorrow of the death of Louis Pasteur. That it offers to his family, to his assistants at the Pasteur Institute, to his country, and to the members of the profession, sincere condolence in the loss of a master of science. His work for the alleviation of human suffering is as he would have chosen —his everlasting monument. His example as an humble and attentive servant and student of nature, is the precious legacy he has left us.

On motion of Dr. McCormack, the resolution was unanimously adopted by a rising vote.

DR. FORMENTO.—In connection with the resolution just adopted by the Association, I move, sir, that the following telegram be sent to Dr. Roux, of the Pasteur Institute, a collaborator of the late scientist:

Resolved, That the American Public Health Association mourns the loss of Pasteur.

DR. HEWITT.—I second the resolution. Carried.

The Secretary then called the roll of the Advisory Council.

Dr. H. B. Horlbeck, of Charleston, S. C., read a paper entitled "Municipal Steam Infection."

Dr. Chas. V. Chapin, of Providence, R. I., read a paper on "Disinfection in American Cities."

Discussed by Dr. Chapin and Dr. Mitchell.

Mr. George J. Kindel, of Denver, asked permission (which was granted) to call attention to what he called "Shoddy rag bedding." He said that for years he had earnestly endeavored to bring about reform in the manufacture of bedding. In the interest of pure and healthy bedding, he, three years ago, visited the health authorities of the cities of Chicago, St. Louis, Cincinnati, Buffalo, and New York city, as well as those of Liverpool and London, Eng. Near New York city is manufactured to-day a shoddy (rag) comforter that is sold in every city in the United States. Shoddy rag mattresses are manufactured in every city of 100,000 inhabitants, except Rochester, N. Y. In Denver, there are two such manufactories, his own, and that of Kent & Stuchfield. It is not by choice, but by compulsion that they are made in Denver. Chicago, Omaha, Lincoln, and Wichita ship them in by the carload, hence we must take them or go out of the bedding business, as in this section four fifths of the bedding was made of this vile stuff.

In addition to the notice of this subject to the State Board of Health, he had again called the attention of the Denver Board of Health to the subject, while a member of the grand jury in April, 1894, when he endeavored to indict himself for making this dangerous bed filling. He had these medical officers to give expert testimony, and they differed widely in their opinion. Some went so far as to say that there was nothing unhealthy or dangerous about such bedding. The grand jury did nothing, except to make a slight mention in its report to the court about it.

Mr. Kindel said that so long as there is no national law governing the subject, just so long will these goods be manufactured and sold under the innocent title of "wool bedding." Every dry goods and house furnishing goods store have these goods on their counters.

Samples of this shoddy rag bedding were exhibited to the Association.

Dr. H. C. Crouch, of Denver, read a paper entitled "Diagnosis of Diphtheria by a New Staining Method." Discussed by Drs. Mitchell, Chapin, Kinyoun, and Swarts.

On motion, the Association adjourned until 2 : 30 P. M.

AFTERNOON SESSION.

The Association reassembled at 2 : 30 P. M., and was called to order by the President.

Dr. Edward Jackson, of Philadelphia, read a paper entitled "Suggestions as to Ocular Hygiene in the Schools."

Discussed by Drs. Lewis (North Carolina), Watson (New Jersey), Holton, Young, Durgin, Bracken, Stewart, and in closing by the essayist.

Dr. C. L. Wilbur, of Lansing, Mich., read a paper entitled, "The Outlook for a General System of Registration of Vital Statistics in the United States."

DR. HOLTON.—I move you, sir, that when we adjourn on Friday, we adjourn to meet at Colorado Springs at 10 o'clock on Monday morning. Carried.

Dr. Charles Denison, of Denver, Col., offered the following resolution, which was referred to the Executive Committee:

WHEREAS it is detrimental to the welfare of our country and degrading to our American civilization to have the intellectual, moral, and physical refuse of other countries dumped upon our shores under a too lax and liberal interpretation of our immigration laws; therefore,

Be it resolved by this Association that the congress of the United States is hereby earnestly requested to not only pass stringent laws, but see that they are enforced, prohibiting the immigration into this country of all criminal and pauper classes, and limiting the introduction into our midst of not only contagious diseases, but gross and apparent cases of such hereditary diseases as insanity, syphilis, tuberculosis, scrofula, and cancer, so far as this can be accomplished through a strict consular surveillance.

Resolved, that in order to make this purpose effective, a National Board of Health is needed and ought to be established, one function of which shall be the proper instruction and direction of foreign consuls as to their duties in this matter.

THE PRESIDENT.—I will appoint on the committee referred to in Dr. MacCormack's resolution Dr. Bryce (chairman), Mr. R. Hering, and Dr. C. O. Probst.

MR. GRAY.—If there is no objection, I will present the report of the auditing committee at this time.

No objection being raised, Mr. Gray said:

"Your committee, appointed to examine the books of the Treasurer, have performed their duty, and find them to be correct."

DR. WILBUR.—I have here four resolutions relating to the matter of

vital statistics, which I wish to submit for reference to the Executive Committee. The members of the Committee on Vital Statistics have individually expressed their approval of them.

The resolutions are as follows:

Resolved, That the American Public Health Association cordially commends the action of the Weather Bureau of the United States Department of Agriculture in undertaking the collection of data relating to Sanitary Climatology.

Resolved, That the American Public Health Association indorses the method, first employed in the last United States census, of studying the vital statistics of certain American cities, as registered by local authority, for a series of years, and recommends that such method of treating vital statistics be carried out, as far as may be practicable by the Twelfth U. S. Census for each year of the present decade. Inasmuch as the collection of accurate vital data implies continuous, and not intermittent, action on the part of the central registration authority, it is obvious that a permanent division of vital statistics, as a part of a permanent census bureau, is essential to the proper conduct of this important branch of the decennial census.

Resolved, That a committee be appointed to prepare a draft of a registration law (*or* to formulate the principles to which a registration law should conform) suitable for adoption by states not having at present an accurate system of registration of births and deaths.

Resolved, That a committee of the American Public Health Association be appointed to present to the Boards of Commissioners appointed by certain states to promote greater uniformity of statute laws, the importance of uniformity in the methods of registration of births and deaths in the several states of the Union.

On motion, the Association adjourned until Thursday, 10 A. M.

THIRD DAY.

THURSDAY, October 3, 1895.

MORNING SESSION.

The Association met at 11 A. M., and was called to order by the President.

THE PRESIDENT.—The first thing in order is a report from the Executive Committee.

THE SECRETARY.—The Executive Committee have considered the resolutions offered by Dr. Wilbur yesterday and recommend that they be referred to the Committee on Nomenclature of Diseases and Forms of Statistics.

DR. WATSON (New Jersey).—I move that the recommendation of the committee be adopted. Carried.

Dr. W. P. Munn, of Denver, read a paper entitled "National Legislation for the Care of the Public Health."

Dr. Gardner T. Swarts, of Providence, R. I., read a paper entitled "Bacteriological Results from Mechanical Filtration," which was discussed by Drs. Bryce, Chapin, Hering, and in closing by the author of the paper.

Dr. S. H. Durgin, of Boston, Mass., followed with a paper on "Medical Inspection of Schools," which was discussed by Drs. Munn, Watson (N. J.) Jamar, and Durgin.

Dr. C. O. Probst, of Columbus, O., chairman, read the report of the Committee on the Disposal of the Dead.

Dr. A. Walter Suiter, of Herkimer, N. Y., read a paper on the "Disposal of the Dead, with Special Reference to the Prevalent Practice of Embalming."

On motion, the Association adjourned until 8 P. M.

EVENING SESSION.

The Association reassembled at 8 P. M. in Unity church, and was called to order by the President.

The first paper was read by Dr. S. E. Solly, of Colorado Springs, entitled "The Influences Peculiar to High Altitudes upon Sanitary Conditions."

Discussed by Drs. Sewall, Orvanaños, Bryce, Weidner, Licéaga, Mendizabal, and, in closing, by the essayist.

Dr. Felix Formento, of New Orleans, chairman, then read the report of the Committee on the Abuse of Alcoholic Drinks from a Sanitary Standpoint.

Dr. Charles Denison, of Denver, followed with a paper entitled "Degenerative Heredity, or Some Degenerative Influences of Modern Civilization on Health."

On motion of Dr. Holton, the Association adjourned until 9 A. M., Friday.

FOURTH DAY.

FRIDAY, October 4, 1895.

MORNING SESSION.

The Association met at 9 A. M., and was called to order by the President.

One or two announcements were made by the Chairman of the Local Committee of Arrangements regarding trips to Colorado Springs and elsewhere.

THE PRESIDENT.—We will now have the report of the Executive Committee.

THE SECRETARY.—The Executive Committee recommend that the Special Committee on Restriction and Prevention of Tuberculosis be discharged.

DR. MCCORMACK.—I move that the action of the committee be concurred in. Carried.

THE SECRETARY.—The Executive Committee further recommend that the Committees on Transportation of the Dead and Disposal of the Dead be combined in one, and to be known as the Committee on Transportation and Disposal of the Dead.

On motion, this recommendation was also adopted.

THE SECRETARY.—I have three applications for membership which the Executive Committee recommend to the Association.

On motion of Dr. Conn, the Secretary was instructed to cast the ballot in favor of the applicants, which he did, and they were declared elected.

The following was received from the Advisory Council:

To the Members of the American Public Health Association.

GENTLEMEN: Your Advisory Council begs to report that it has performed the duties required of it, and respectfully submits the following nominations for the various offices of your Association for the ensuing term, viz.:

President, Dr. Edward Licéaga, of the City of Mexico, Mex.; First Vice-President, Dr. A. A. Woodhull, U. S. Army, Denver, Col.; Second Vice-President, Dr. Henry Sewall, Denver, Col.; Secretary, Dr. Irving A. Watson, Concord, N. H.; Treasurer, Dr. Henry D. Holton, Brattleboro, Vt.; Executive Committee, Dr. J. C. Shrader, Iowa City, Iowa; Dr. R. S. Goodwin, Thomaston, Conn.; Dr. James F. McShane, Baltimore, Md.

Your Council also begs to suggest the city of Buffalo, N. Y., as the place for holding the next annual meeting of your Association.

Respectfully submitted,
CROSBY GRAY, *Secretary.*

THE PRESIDENT.—You have heard the report of the Advisory Council. What disposition will you make of it?

DR. L. H. MONTGOMERY.—I move that the report be adopted. Carried.

DR. MCCORMACK.—I understand the President in his annual address offered a suggestion which can only be adopted by unanimous consent, and that is, that the option of changing the time of meeting to some time in September be left to the President and Secretary, if deemed advisable, so that teachers of hygiene in our medical colleges and many other representative men who desire to attend the meetings may have an opportunity to do so without interfering with the performance of their duties in colleges. It would add to the attendance and interest of the Association, and I think it would be safe to entrust this matter to the officers named. I, therefore, move that this option be placed in the hands of the President, Vice-Presidents, and Secretary of the Association to change the time of meeting to September for next year, and I ask that unanimous consent be given, in order that there may be no interference with the provisions of our Constitution and By-Laws. (This consent was given.)

The President then appointed the special committees, and said in regard to the members of the Advisory Council from the Republic of Mexico, that he would ask, as a special favor, that the President-elect, Dr. Licéaga, make the appointments at his convenience and announce them to the Secretary; that he himself was not prepared to make suitable appointments for the Advisory Council from the States of Mexico.

MR. GRAY, of Pittsburg.—In order that the Association may not embarrass the local committee and itself by holding an extended session this morning, I therefore move that the Association adjourn at 11:45 this morning. Carried.

Dr. McCormack offered the following resolution of thanks, which was unanimously adopted:

Resolved, That the members of the American Public Health Association desire and hereby tender most cordial thanks to all concerned in inviting and bringing the twenty-third annual meeting of the Association to the beautiful Queen City of the Plains; to the Committee of Arrangements, the physicians and citizens, the Chamber of Commerce, and especially to the ladies of Denver for the attentions and charming hospitalities which have made the stay here a continued pleasure; to the various railroad companies for reduced rates, to the Brown Palace Hotel for the use of its hall, and to the newspapers for reports of proceedings. We also express thanks to Dr. Cantwell and other citizens of Davenport, Ia., for courtesies extended at that point, and to the retiring president, Dr. Bailey, for the able, courteous, and dignified manner in which he has presided over the meeting.

THE PRESIDENT.—Reports of committees or resolutions are now in order.

DR. MITCHELL.—I move that a committee of three be appointed to present the postmaster-general with the resolutions adopted during this meeting, and which were offered by me.

Seconded.

THE PRESIDENT.—I understand that the resolution offered by Dr. Mitchell embraces the Dominion of Canada, the United States, and the Republic of Mexico. If so, there ought to be a committee from each government appointed. The association can do whatever it thinks best in this matter.

DR. MITCHELL.—I will modify my motion so as to conform with that.

The motion as amended was carried.

THE SECRETARY.—I will say with regard to the Committee on the Pollution of Water Supplies, that I am requested by Dr. Smart to say that the committee is hard at work. I suppose all the members of the Association know that Dr. Smart caused a meeting to be held in New York in June last, to which noted bacteriologists were invited. That meeting was a success. Several valuable papers were read and discussed, and the entire work of the meeting will appear in the October issue of the quarterly. Dr. Smart regrets being unable to be present at this meeting on account of detail work which prevented him from leaving Washington this week.

Mr. Rudolph Hering, C. E., of New York city, chairman, read the report of the Committee on the Disposal of Garbage and Refuse.

On motion, the report was accepted and the committee continued.

The secretary stated that the Committee on Nomenclature of Diseases and Forms of Statistics simply desired to report progress at this time.

There were no reports from the following committees: On Protective Inoculations in Infectious Diseases, on National Health Legislation, on the Cause and Prevention of Diphtheria, on the Causes and Prevention of Infant Mortality.

With reference to the report of the International Committee on the Prevention of the Spread of Yellow Fever, Dr. Formento said that the committee desired to report progress at this time, but that it hopes to present an interesting report next year.

There were no reports from the following committees: On Steamship and Steamboat Sanitation and on Transportation of the Dead.

THE SECRETARY.—Before we proceed to the reading of papers, I will say that by some oversight a paper on "The Means of Correcting Abuses of Alcoholic Drinks," by Dr. Garciadiego, of Mexico, was omitted from the program.

A motion was then made that all papers which could not be read this morning be referred to the Publication Committee. Carried.

THE SECRETARY.—It was impossible to place the papers of our Mexican *confreres* on the program until to-day, which indeed is very unfortunate because of our short session.

Dr. Eduardo Licéaga, of Mexico, Mex., then contributed a paper on "The Study of Yellow Fever in Connection with Its Medical Geography and Prophylaxis in the Mexican Republic."

Dr. Manuel Carmona y Valle, of Mexico, Mex., read a paper on "Prophylaxis of Yellow Fever."

Discussed by Drs. Woodhull and Formento.

Dr. J. E. Monjaras, of San Luis Potosi, Mex., followed with a paper entitled "Necessity for the Establishment of Sanatoria to Prevent Chlorosis as the best Prophylactic Against Consumption in Particular and Constitutional Diseases in General."

Dr. G. Mendizabal, of Vera Cruz, Mex., read a paper on "Baths: Their Necessity; Their Influence in Economy; the Dangers they Present, and the Methods of Preventing Them."

Dr. Formento offered the following resolution:

Resolved, That the subject presented in the paper of Dr. Suiter be referred to the Committee on Disposal of the Dead, with the request that if they see proper to report a resolution favorable to the enactment of laws to control the practice of embalming dead bodies.

Referred to the Executive Committee.

The President then appointed Drs. Formento and Horlbeck to escort the President-elect to the chair.

THE PRESIDENT.—I have great pleasure in presenting to you your next President, who is known as a sanitarian of world-wide reputation, Dr. Licéaga of Mexico.

Dr. Licéaga was greeted with applause. He said,—"I consider the honor bestowed upon me as an honor to my country, and I thank the association. I consider that among my own countrymen present there are men more worthy of the honor, and on that account I feel a personal debt of gratitude to the association. I assure you that my deficiencies will be compensated by devoting all my intelligence, good will, and energy to become worthy of the great honor conferred upon me." (Applause.)

President Bailey, in retiring, said,—"It only remains for me, before closing this meeting, to thank you as kindly as I know how for the honor you conferred upon me at Montreal; and particularly do I thank you for

the kindness and the courtesy that have been extended to me during the sessions of the association in my feeble efforts to preside over this meeting. I came with a limited experience in the management of such bodies, but your kindness has made it easy and to me always pleasant. It shall be one of the delights of my life to remember the meeting of the American Public Health Association in the city of Denver. I may at times have appeared to be somewhat arbitrary in my rulings, but with no effort to arrogate to myself authority, and I deemed it for the best interests of the Association in the despatch of its business. I have endeavored to do my duty, and it remains for me now to declare the Association adjourned to meet in the city of Colorado Springs, Monday, at 10 o'clock, in the Antlers hotel.

COLORADO SPRINGS, COL., October 7, 1895.

The Association met at the Antlers hotel, according to adjournment. Some forty or fifty members of the Association were present. Remarks were made by President Bailey and others. Dr. S. D. Swope, of Deming, N. M., offered the following resolution:

Resolved, That the thanks of the American Public Health Association be tendered to the El Paso Medical Society for the cordial reception and entertainment given the Association; to the electric car company for the free use of their excellent trolley system; to the Casino company for especially opening their delightful resort for our entertainment; to the citizens of Colorado Springs for a drive through the Garden of the Gods; and to Dr. Bell, of Manitou, for an enjoyable afternoon tea.

The foregoing resolution was unanimously adopted by a rising vote.

Adjourned *sine die*.

REPORT OF THE TREASURER.

BRATTLEBORO, VT., September 23, 1895.

HENRY D. HOLTON,

in account with

THE AMERICAN PUBLIC HEALTH ASSOCIATION.

RECEIPTS.

1894		DR.
Sept. 24.	To cash on hand	$1,367.74
	from sale of Transactions	379.00
	from Dues of members	1,880.26
	Total	$3,627.00

DISBURSEMENTS.

1894		CR.
Sept. 24.	Paid I. A. Watson expenses as per bill, Order No. 21	$342.25
Oct. 2.	Republican Press Association as per bill for printing, etc., Order No. 22	673.67
Oct. 2.	Nelson M. Barrett for translating as per bill, Order No. 23	16.20
Oct. 13.	Henry D. Holton, secretary and treasurer, expenses Montreal Meeting, as per bill, Order No. 24	71.95
Nov. 23.	American Express Co., express charges as per bill, Order No. 25	51.40
Dec. 6.	William Whitford, stenographer Montreal Meeting, as per bill, Order No. 26	79.50
Dec. 19.	A. P. Cushing, reading proof, Spanish, as per bill, Order No. 27	59.00
1895		
Jan. 3.	Republican Press Association for printing as per bill, Order No. 28	505.25
June 21.	American Express Co., express charges, as per bill, Order No. 29	3.60
July 3.	Republican Press Association, printing Spanish edition, as per bill, Order No. 30	895.94
July 17.	Charles Smart, reporting Bacteriological Convention, as per bill, Order No. 31	36.60
Sept. 23.	Republican Press Association, printing, etc., as per bill, Order No. 32	195.74
Sept. 18.	Henry D. Holton, office expenses, printing, etc., as per bill, Order No. 33	121.82
Sept. 23.	Cash on hand[1]	574.08
	Total	$3,627.00

DENVER, October 2, 1895.

To the American Public Health Association:

GENTLEMEN: The undersigned auditing committee begs leave to report that it has examined the books and annual report of the treasurer for the past year, and finds them to be correct.

Respectfully submitted,

CROSBY GRAY,
H. B. HORLBECK,
J. N. McCORMACK,
Auditing Committee.

[1] This includes balance of Index fund unexpended of $493.98.

EDITORIAL NOTES.

INSPECTION OF MEAT AND MILK.

GENERAL INSPECTION OF SLAUGHTERED ANIMALS.

The following figures are published in the *Revue des Sciences Mèdicales* (October 15, 1895, p. 547):

In Prussia, there were slaughtered from April, 1893, to April, 1894, 695,882 cattle and 1,027,480 calves. Out of this number there were rejected in consequence of the presence of tuberculosis, 8.9 per cent. of the adult cattle and only .04 per cent. of the calves.

The ratio of tuberculous animals differed considerably in the different cities, being only 1.2 per cent. in Hanover, and as high as 14.6 per cent. in Berlin and 17.5 per cent. in Magdeburg. The report goes on to say: These figures express rather the degree of thoroughness of inspection at the different abattoirs than the actual prevalence of tuberculosis among animals in the different localities.

In 1893, in twenty-six cities of the kingdom of Saxony, where an inspection of meat was conducted, 659,840 animals were examined at the slaughter-houses. Of these, 36,339 were rejected; some of the latter were destroyed, while 3,503 were sold to the small butcher-shops.

Out of the whole number slaughtered and examined, 12,630 were found to be tuberculous, or in the proportion of 18.3 per cent. of the cattle, 0.12 per cent. of the calves.

ON THE PRESENCE OF TUBERCLE BACILLI IN COMMERCIAL MILK.

Milk bought in the usual manner is nearly always a mixture of milk from several different cattle. Owing to the prevalence of tubercle amongst cattle, the probability is, that not unfrequently tubercle bacilli pass into such milk. The author describes the results of experiments made by inoculating forty healthy young guinea-pigs with milk bought in the open market. The milk was bought in half liter bottles furnished with a patent india-rubber fastening. Four of the animals died of advanced tubercle, and post-mortem examination showed that this was peritoneal. Eight of the animals, further, died within eight or ten hours, not from tubercle, but from another organism (which the author isolated) peculiarly pathogenic to guinea-pigs.

In another series of experiments, guinea-pigs were inoculated with the cream, and 38 per cent. of them became infected with tubercle. General experience shows that there are districts where tubercle amongst cattle is rare. For example, where the animals spend much of their time in the pastures, the disease is much rarer than it is amongst those which are stall-fed. When, however, tubercle has once taken root in a district, or a

herd, it is difficult to get rid of it. Boiling the milk is a sufficient protection against infection from the milk itself, but does not go to the root of the matter. The use of animals infected with tubercle must be combatted by introducing rational methods of feeding and better housing, and, above all, by employing tuberculin as a means of diagnosing the disease, as is now being done so largely in Denmark, Holland, and France.

[Dr. Obermüller in Hygienische Rundschau, October 1, 1895.]

LEAD POISONING BY PUBLIC WATER SUPPLIES.

Much trouble has been occasioned in several districts in England in the past five years or more, notably in Yorkshire, from the use of drinking-water conveyed by lead pipes. A very interesting and valuable discussion on this subject occurred at a meeting of the medical health officers of Yorkshire in December, 1894.

Dr. Whitelegge stated that the waters which exercised plumbo-solvent action were mainly those which came from peat districts. He advocated an obligatory experimental inquiry as to the action of the water on lead in connection with every new water scheme where the source was in a moorland district, this point being scarcely less important than those which related to purity, sufficiency, and cost.

One after another, the great water corporations who supplied plumbo-solvent water had found themselves compelled to adopt preventive measures by way of filtration and chemical treatment, but not until much mischief had been done. Either chemical treatment or filtration involved considerable cost, especially with the more acid waters, and it could not be assured that entire success would be obtained.

Dr. Hunter referred to the subtle character of lead poison, and to the fact that lead poisoning may have a strong hold upon a district and be doing irreparable damage unsuspected for some time by the local medical men.

Dr. Hunter presents the following list of ailments found in persons exposed to the influence of drinking-water containing lead solution, and shows that this form of poison affects nearly every organ in the body:

1. A state of physical and mental depression, well described as a state of listless languor, a condition of body and mind where everything seems a trouble, where life seems oppressed by an unaccountable burden, and where the only thing to do is to sit down in a state of misery and let things take their course.

2. Anæmia, with its attendant evils. This, says Dr. Oliver, is the one physical sign above all others which indicates that the system is becoming impregnated with lead.

3. Blue line on the gums. This is present in a number of cases that show no other sign, and on the other hand, may be absent in severe cases.

4. Colic. A common and early symptom.

5. Digestive troubles, *e. g.*, pain, vomiting, nausea, constipation, or diarrhœa.

6. Various irregularities of the functions of the reproductive organs of women, and frequently causes abortion to an extent sufficient to affect the birth-rate.

7. An injurious effect on the male reproductive organs.

8. As a consequence of these, the deaths of newly-born children.

9. A whole train of severe nervous diseases; *e. g.*,—

(*a*). Ill-defined pains, and cramp-like sensations in the limbs and pains in the joints.

(*b*). Weakness and wasting of the muscles, leading on to paralysis.

10. Blindness.

11. Diseases of the liver.

12. Diseases of the kidney, which often are chronic and cause death after a lingering period of misery and suffering years after the original cause is forgotten; and following on from these, the heart and blood vessels are affected.

13. Gout, according to some, is frequently caused by lead poisoning; others say that it is only a coincidence and not the result of plumbism. Dr. H. agrees with the latter.

In regard to the limit of safety, Dr. Whitelegge states that no water should be used for drinking which contains more than one part per million, and *any trace*, *however minute*, indicates danger. (Public Health, London, 1895.)

An epidemic of lead poisoning has recently occurred in a small Massachusetts town of scarcely 1,500 inhabitants, where twenty-five persons exhibited well-marked symptoms of lead poisoning in varying degrees. These cases mostly occurred during the past summer (1895), and in each instance, or in nearly all, it was found that the water which stood in the lead pipes all night had not been carefully withdrawn and rejected. Lead pipes were used in this town everywhere for connecting the houses with the street mains, and in some cases these pipes were several hundred feet in length. The symptoms observed embraced nearly all of those which are named in the foregoing summary by Dr. Hunter. The amount of lead found in the water in several instances was as high as one half grain per gallon, and lead was found in the urine of patients where examinations for it were conducted.

VITAL STATISTICS.

The following tables were selected from the recently published pamphlet entitled "A Summary of the Vital Statistics of the New England States."

We also take the liberty of presenting the following paragraphs from the introductory pages of this pamphlet which are intended to set forth its object:

"At a meeting of the secretaries of the Boards of Health of the six New England States, held in Montreal, in September, 1894, during the session of the American Public Health Association, it was decided to publish a summary of the vital statistics of these states. The objects to be secured by such a publication may be stated briefly, as follows:

1. The securing of better and more uniform methods of the presentation of material collected in the registration returns.

2. The stimulation of attention to this important branch of public work in other states where registration has hitherto been neglected.

In New England the importance of registration of vital statistics has been acknowledged from the earliest periods of the existence of the colonies, a law having been enacted in 1639, in the Massachusetts colony providing for the keeping of a record "of every marriage, birth, and death of every person within the jurisdiction." This was followed soon afterward (1644) by similar legislation in Connecticut.

It was not until 1842 that any published report embracing these facts was made.

The six New England states have now published such reports for the stated periods, as follows:

Maine,	. . . . .	beginning with	1892.
New Hampshire,	. . .	" "	1880.
Vermont,	. . . . .	" "	1857.
Massachusetts,	. . . .	" "	1842.
Rhode Island,	. . . .	" "	1853.
Connecticut,	. . . .	" "	1848.

The importance of the subject of vital statistics as the basis or groundwork of public hygiene is universally acknowledged, and the intimate connection of the one with the other is shown by the action of nearly every state government in uniting the department of registration of vital statistics with that of public health."

Summary of the Vital Statistics of the Principal Countries of Europe for Twenty years, and for 1891 and 1892, together with those of the New England States.

States and Countries.	Twenty Years—1871–1890.				1891.				1892.			
	Marriage Rate.	Birth Rate.	Death Rate.	Excess of Birth Rate over Death Rate.	Marriage Rate.	Birth Rate.	Death Rate.	Excess of Birth Rate over Death Rate.	Marriage Rate.	Birth Rate.	Death Rate.	Excess of Birth Rate over Death Rate.
New England	.....	.....	.....	.....	18.5‖	25.2‖	19.0‖	5.3‖	18.5	24.9	19.9	5.0
Maine	.....	.....	.....	.....	.....	.....	.....	.....	17.3	20.7	18.4	2.3
New Hampshire	18.6*	18.0*	18.9*	.....	20.6	19.2*	18.7	.....	21.3	19.1	20.1	.....
Vermont	15.6	20.2	15.1	5.1	16.9	20.0	16.2	3.8	17.5	19.7	17.9	1.8
Massachusetts	18.1	25.7	19.7	6.0	18.3	27.4	19.6	7.8	19.0	27.8	20.6	7.2
Rhode Island	18.7	23.7	18.0	5.7	18.7	25.8	18.7	7.1	19.3	24.5	20.4	4.2
Connecticut	16.0	23.6	17.1	6.5	17.1	23.5	18.9	3.3	17.0	24.5	19.6	4.9
England and Wales	15.6	34.0	20.3	13.7	15.6	31.4	20.2	11.2	15.4	30.5	19.0	11.5
Scotland	13.9	33.6	20.4	13.2	13.9	31.2	20.7	10.5	14.1	30.7	18.5	12.2
Ireland	9.0	24.9	18.0	6.9	9.2	23.1	18.4	4.7	9.3	22.4	19.4	3.0
Italy	15.6	37.3	28.6	8.7	15.0	37.3	26.2	11.1	15.0	36.3	26.2	10.1
Denmark	15.2	31.7	19.0	12.7	13.6	31.0	20.0	11.0	13.6	29.5	19.4	10.1
Norway	13.7	30.7	16.9	13.8	13.2	30.9	17.5	13.4	12.6	29.6	17.7	11.9
Sweden	13.1	29.8	17.6	12.2	11.6	28.3	16.8	11.5	11.4	27.0	17.9	9.1
Austria	16.3	38.6	30.6	8.0	15.4	38.1	27.9	10.2	15.6	36.2	28.8	7.4
Hungary†	19.1	44.0	33.7	10.3	17.2	42.3	33.1	9.2	18.4	40.3	35.0	5.3
Switzerland	14.7	29.4	22.1	7.3	14.3	28.2	20.7	7.5	14.7	28.0	19.3	8.7
German Empire‡	16.4	38.1	26.0	12.1	16.1	37.0	23.4	13.6	15.9	35.7	24.1	11.6
Holland	15.1	35.2	22.6	12.6	14.2	33.7	20.7	13.0	14.4	32.0	21.0	11.0
Belgium	14.2	31.0	21.4	9.6	14.8	29.6	21.0	8.6	15.4	28.9	21.8	7.1
France	15.4	24.6	22.8	1.8	15.0	22.6	22.6	0.0	15.2	22.1	22.6	—0.5§

*Seven years. Registration of births said to be defective. †Fifteen years. ‡Nineteen years. §Excess of death rate. ‖In the figures for New England for 1891 Maine is not included.

CAUSES OF DEATH, 1892.

Number of Deaths in each State from each of Certain Specified Causes, together with the ratio per 10,000 of the Estimated Population.

Diseases or Causes of Death.	Maine.		New Hampshire.		Vermont.		Massachusetts.		Rhode Island.		Connecticut.		New England.	
	Deaths.	Per 10,000 Living.	Deaths.	Per 10,000 Living.	Deaths.	Per 10,000 Living.	Deaths.	Per 10,000 Living.	Deaths.	Per 10,000 Living.	Deaths.	Per 10,000 Living.	Deaths.	Per 10,000 Living.
Small-pox	.....	.....	.....	.....	.....	.....	2	.01	4	.1	4	.05	10	.02
Measles	29	.4	24	.6	8	.2	88	.4	28	.8	49	.6	226	.5
Scarlet Fever	36	.5	27	.7	43	1.3	669	2.8	67	1.8	280	3.6	1,122	2.3
Diphtheria and Croup	212	3.2	179	4.7	187	5.6	1,455	6.1	178	4.9	542	7.0	2,750	5.6
Typhoid Fever	286	4.3	108	2.8	121	3.6	827	3.5	139	3.8	331	4.3	1,812	3.7
Cholera Infantum	546	8.2	366	9.5	211	6.3	2,898	12.2	632	17.4	968	12.5	5,621	11.5
Phthisis	1,352	20.4	736	19.2	645	19.4	5,739	24.2	809	22.3	1,386	18.3	10,667	21.8
Pneumonia	1,431	21.6	890	23.2	848	25.4	5,020	21.5	655	18.1	1,493	19.3	10,337	21.2
Bronchitis	287	4.3	217	5.7	45	1.3	1,886	7.9	308	8.5	546	7.1	3,287	6.7
Influenza	755	11.4	331	8.6	384	11.5	967	4.1	336	9.2	564	7.3	3,337	6.8
Whooping Cough	54	.8	37	1.0	16	.5	248	1.0	25	.7	64	.8	444	.9
Cerebro Spinal Meningitis	38	.6	19	.5	55	1.6	86	.4	18	.5	46	.6	262	.5
Malarial Fever	13	.2	3	.1	4	.1	81	.3	36	1.0	99	1.3	236	.5
Erysipelas	31	.5	39	1.0	21	.6	234	1.0	25	.7	62	.8	412	.8
Puerperal Fever	42	.6	25	.6	3	.1	81	.3	30	.8	78	1.0	259	.6
Dysentery	48	.7	42	1.3	29	.9	193	.8	71	2.0	105	1.4	488	1.0
Diarrhœa and Cholera Morbus	68	1.0	70	1.8	30	.9	637	2.7	161	4.4	170	2.2	1,136	2.3
Cancer	404	6.1	235	6.1	204	6.1	1,402	5.9	181	5.0	370	4.8	2,796	5.7
Apoplexy and Paralysis	793	12.0	517	13.5	398	12.0	2,880	12.1	362	9.9	704	9.1	5,654	11.6
Insanity	85	1.3	33	.9	11	.3	253	1.1	27	.7	60	.8	469	1.0
All Other Diseases of Nervous System	692	10.4	431	11.2	192	5.8	3,054	12.9	354	9.7	1,100	14.2	5,823	11.9
Diseases of Circulatory Organs	895	13.5	611	15.9	614	18.5	4,150	17.5	509	14.0	1,125	14.5	7,900	16.2
Diseases of the Kidneys	265	4.0	222	5.8	149	4.5	1,569	6.6	258	7.1	482	6.2	2,945	6.0
Accident	376	5.7	229	6.0	150	4.5	1,819	7.6	309	8.5	587	7.6	3,620	7.4
Suicide	59	.9	51	1.3	24	.7	274	1.2	19	.5	93	1.2	520	1.1
Old Age	780	11.8	441	11.5	399	12.0	1,895	8.0	256	7.0	643	8.3	4,414	9.0

THE CASE-MORTALITY OF SCARLET-FEVER (FATALITY).

The annual report of the Statistical Committee of the Metropolitan Asylums Board (London) shows that the ratio of deaths to cases was 6.18 per cent. in 1894. A valuable table is also presented which gives the mortality at different ages, made up from a total of 81,350 admissions to the hospitals during the twenty-four years, 1871–1894.

The results are as follows;

Ages.	Males.	Females.	Combined mortality per cent. for both sexes.
Under 5 years	18.1	17.0	17.6
5–10 years	5.6	5.1	5.3
10–15 "	2.3	2.4	2 4
15–20 "	3.0	2.3	2.6
20–25 "	2.3	2 8	2.6
25–30 "	3.8	2.8	3.1
30–35 "	5.2	4.3	4.7
35–40 "	8.1	4.4	5.7
40 years and over	8.2	4.5	6.2

The general mortality from this cause is usually less at each age than that observed in the hospitals, since many of the lighter cases do not go to the hospitals.

—*Public Health, June, 1895, p. 333.*

FACTORS INFLUENCING THE GENERAL DEATH-RATE.

It is a common error to assume that because the death-rate of one district is lower than that of another district the former is necessarily the healthier. There are other factors influencing the death-rate which require to be considered. For instance, a district containing a proportionately larger number of elderly people will, other things being equal, have a higher death-rate than a district with a smaller number. A suburb consisting mostly of better-class residences will contain a large number of domestics, and as the ages of the latter will be within those age-periods in which the least number of deaths occur, the death-rate of such a place will thereby be lowered. It is almost unnecessary to say that the social status of the inhabitants of any place is an important factor in its death-rate. A high birth-rate increases the death-rate, at least for a time; but in ten or fifteen years, presuming that there is no marked immigration of young persons, the death-rate will become lower, inasmuch as there will then be a large number of persons between the ages of five and twenty-five, during which period the incidence of mortality is at its lowest. Inversely, a low birth-rate at first lowers the death-rate, but after the lapse of years, increases it, the number of persons between the ages of five and twenty-five being small. Another factor in the death-rate is the nature of the industry or industries carried on in the district.

—*Public Health, March, 1895, p. 233.*

Hence the fallacy of comparing the gross or general death-rates of new cities and towns in the newer regions of the United States with those of the older cities upon the Atlantic seaboard. Since, in the former, the population is largely made up of the vigorous class (young men between the ages of fifteen and fifty) in whom the death-rate should not be much over 10 per 1,000. While in the older cities a large part of the population (40 per cent.) is composed of children under fifteen and of persons over fifty, in both of which classes the death-rate is always high.

INFANT MORTALITY.

Employment of mothers away from home as a cause of infant mortality. In a very full discussion of the subject of infant mortality in "*Public Health*," February, 1895, considerable stress is laid upon the employment of married women as a cause. Infant mortality is high in the large factory towns of England, and various measures are suggested for its prevention: the prevention of employment of women during the weeks immediately preceding as well as following confinement; the establishment of crêches in the immediate neighborhood of the factories, or even in connection with them and under the management of the owners of mills. Such crêches exist in Dublin and other cities, where infants are cared for at prices varying from 1d. to 2d. per day (2 to 4 cents).

In proof of the effect of employment of married women on infant mortality, the following extract from the twenty-third annual report of the Massachusetts State Board of Health (1891, p. 836) is presented:

"Out of the entire population of the state in 1885 (1,942,141) there were 13,521 married women employed in factories. The five factory cities and towns standing at the extreme of high mortality from cholera infantum had a population of 193,952 in 1885, or 10 per cent. of the total population of the state; and 3,395 married women in these places were employed in factories, or 25 per cent. of all married women so employed in the state. The ratio of married women so employed in these places to the total population was 1.7 per cent., while in the state it was but $\frac{7}{10}$ of 1 per cent. The highest ratio of this class to the total population was in Fall River (3.1 per cent., or 1,776), and this city had the highest death-rate from cholera infantum, being nearly double that of Boston, in a series of twenty years."

Crêches. Closely allied to the foregoing subject is that of crêches, and an important contribution may be found in the *Revue d'Hygiene* for November, 1895, by Inspector General Dr. Napias. The writer makes the following suggestions:

"That crêches should present in their construction at least as good hygienic conditions as should be required for every human habitation."

That, so far as infection is concerned, it should be made certain that the infant brings nothing whatever to the crêche, and that he carries no infection home to his family, and to this end the disinfection of the

clothing which the infant wears at entrance and of that which he wears home should be accomplished as thoroughly as possible.

That daily baths should be required.

That the furniture and bedding should be of such material as will not readily admit of infection, and there should be separate toilet articles for each infant.

The bottles containing the sterilized milk should not admit of infection.

The attendants should have the necessary training, acquired by study and properly certified.

Dr. Napias states that these excellent institutions now number 58 in Paris and 29 in the suburbs of the Department of the Seine. The number of other cities and towns in France where crêches now exist is 147.

He gives general plans and descriptions of some of the best of these establishments.

The expense of construction, etc., of one of the larger of these was as follows:

Construction,	29,450.00 francs.
Furnishing,	4,690.60 "
Heating and ventilation,	2,459.50 "
Cooking and other utensils,	1,110.00 "
Lavatories and water-closets,	1,880.00 "
Upholstering and bedding,	1,803.60 "
Linen, handkerchiefs, blankets, rubber cloths, etc., etc.,	2,130.70 "
Miscellaneous,	550.00 "
Total,	44,074.40 francs.

= about $8,800.00

Annual expenses of management:

One superintendent,	800.00 francs.
One assistant superintendent,	600.00 "
Four "rockers" (berceuses),	2,000.00 "
One physician,	400.00 "
Subsistence for six persons,	2,250.00 "
Food for infants, washing, heating, lighting, etc.,	4,000.00 "
	10,050.00 francs.

= about $2,000.00

The actual expense amounted to about 255 francs ($50) per bed or cradle.

The Monthly Bulletin of the Superior Board of Health of Mexico for November contains several papers which are worthy of notice.

Dr. Carbajal presents a paper upon "Ventilation," in which he gives certain facts in regard to the peculiar conditions relative to the respiratory functions which prevail in high altitudes. The following table shows the principal points in this connection:

	Number of Respirations per minute.	Mean Circumference of Thorax.	Length of Sternum.	Chest Expansion.	Cubic capacity of Inspired Air per Respiration.
Paris.....	18	m. .850	m. .160	m. .07 to .08	Litre .50
Mexico.....	22	m. .886	m. .177	" .10	" .52
Difference	4	m. .036	m. .017	" .02	" .02

He further states that the average number of respirations in the adult is in proportion to the altitude of the district, and inversely as the atmospheric pressure of the inspired air.

In Paris with a barometric pressure of 750 m. (= 29.5 in.), an adult inspires 8.5 litres per minute, and in Mexico with a pressure of 580 m. (= 22.8 in.), he inspires 11 litres per minute, or 510 litres in Paris per hour and 660 in Mexico.

	Oxygen by weight.
A litre of air at 60° F., and 29.5 pressure contains	0.275
A litre of air at 60° F., and 22.8 pressure contains	0.220
Difference, ...	gm. 0.055

Quantity of oxygen inspired, by weight in 24 hours:

In Paris, ...	3,422 gm.
In Mexico	3,483 gm.
Difference in favor of Mexico, . .	61 gm.

	Paris.	Mexico.
Average vital capacity, ...	3 litres.	4 litres.

Dr. Barragan contributes a brief paper on the health of Matamoras. Among the prevalent diseases of that region, he alludes to the frequency of tuberculosis, gastro-enteric diseases, and tetanus, the latter being common among infants, and attributable by Dr. Barragan to the practice among ignorant midwives of dressing the umbilical cord with a filthy mixture of grease and powdered rosemary.

Dr. Dusina contributes an article on the adulteration of saffron, which is found to be seriously tampered with in Mexico. Out of 231 samples examined at the Chemical Laboratory of the Superior Board of Health only 14.3 were of good quality. In one sample a considerable quantity of muscular fibre of meat was found. Others contained small roots and other undetermined vegetable fibres, artificially colored with orange-red coloring matter. In order to increase the weight a quantity

of sulphate of lime or baryta is added, and is shown by the analysis, which in pure saffron gives only 8.5 per cent. of ash, but these heavy mineral powders gave a percentage of 29 to 38.7 per cent. of ash.[1]

The deaths in the city of Mexico in October, 1895, were 1,155. The principal causes and number of deaths from each were: typhus, 23; whooping-cough, 32; tuberculous diseases, 94; heart diseases, 39; bronchitis, 75; pneumonia, 95; gastro-enteritis, enteritis, colitis, etc., 213; cirrhosis of liver, 36. Disinfection is practised in cases of typhus, whooping cough, diphtheria, tuberculosis, scarlet fever, and pneumonia, 70 houses, 104 rooms being disinfected in October, together with 1,471 articles of clothing in the public disinfector.

The number of persons vaccinated was 1,912, of which number 1,730 were in the city of Mexico. Four hundred and one tubes of vaccine lymph were issued to different parts of the country.

The fines imposed for violation of the food laws amounted to $290 (Mexican money).

Persons treated at the institute for cure of hydrophobia, 35, of which number 14 had begun treatment in September, 8 had begun and terminated their treatment in October, and 13 had begun treatment in October and completed it in the following November.

Articles of food examined in October, 270, of which fifty were adulterated, mostly milk and coffee. Animals inspected, 2,636, all of which were found to be in sound condition.

"VITAPATH."

A "vitapath," so called, was recently arrested in Ohio for practising medicine without a license, in violation of the state law. The patient whom he treated was allowed to die without any other medical attendance. The quack was fined by Judge Dustin of Cincinnati, who delivered the following opinion: "Men who knowingly go into a sick-room and prevent anything being done for a dying man by silly incantations and laying on of hands, are responsible for his death, and ought to be on a par with a murderer in the eyes of the law. God help the dying man who relies upon you or any of the so-called graduates of quackery. You speak of vitapathy being of a higher power than medicine, and you say you ordain ministers at the same time you matriculate vitapathic physicians. Your methods are an insult to intelligence, their practice is a criminal abuse of ignorance, and your college a disgrace to civilization."

SCHOOL HYGIENE.

It is stated that the New York state board of health have requested the board of education to enforce the following rules in the schools of the state: 1. The use of slates, slate pencils, and sponges shall be discon-

[1]NOTE. Saffron in the United States is largely adulterated, but the adulteration consists chiefly of an inferior article known as safflower.

tinued in all the public schools. 2. According to requirement, pupils shall be supplied with pencils and penholders, each pupil to retain those received in a box provided for the purpose, such box to be marked with the pupil's name. Pencils and penholders shall not be transferred from one pupil to another without suitable disinfection. 3. All school property left in the school building by a sick child with any contagious disease, and all such property found in an apartment occupied by a family in which a case of small-pox, typhus fever, diphtheria, scarlet fever, or measles has occurred, shall be taken by the health department for disinfection or destruction. 4. Books which are taken home by pupils shall be covered regularly once each month with brown manilla paper. 5. Places for drinking water on the ground floors of the school buildings shall be discontinued, and a covered pitcher provided for each class-room, in which fresh water shall be placed before every session. A numbered cup to be kept in the class-room shall be issued to each pupil. No interchange of cups shall be allowed.

In connection with the subject of school books and infectious diseases, the *London Lancet* says editorially: "We have, from time to time, referred to the risks that may be incurred by the reissue at a public library of books returned from infected houses, and it is certain that at the present time there are many medical officers of health who are taking steps towards the mitigation of these risks by notification to the librarian of the infected houses and by a disinfection of the infected books. Dr. Niven of Manchester, in his annual report for 1894, draws attention to the fact that in many schools the books used by the children are collected together into one room at the end of the day and redistributed indiscriminately on the following day without regard to the possible conveyance of infection by such means. It follows from this that a child with the initial symptoms of diphtheria or scarlet fever may have used a book on one day which on the day following may be used by a healthy child. This is certainly a risk which school managers will do well to consider. as also is the question of the separation of children's overclothing in the lobby. It would be well, too, in the same sense, to have regard to the distribution of slates and pencils, and to the use of towels in the lavatories."

SANITATION IN JAPAN.

Dr. Eldridge states that during the late epidemic there were 1,382 cases of cholera in Japan itself, says the *British Medical Journal*, representing, probably, the invasion of at least a hundred different localities, and yet, with the exception of certain of the military ports at which the imported cases were first received and where it has been most successfully handled and restricted, the disease has in every instance been stamped out with the occurrence of the first half dozen cases. Considering that thousands of troops and coolies are now returning to their homes, the work accomplished this year by the Japanese in controlling and lim-

iting the spread of cholera is not only marvellous, but, he thinks, unprecedented. Until within a few years the introduction of even a single case of cholera practically ensured a widespread epidemic. The sanitary system of Japan dates from 1877 only, and its officers have had to be educated and trained *ab initio*. As a matter of fact the government has had so far during the present emergency no advice or assistance whatever from foreign experts.

KISMET.

The letters which have lately appeared in one of our daily contemporaries, upon the infectious nature of measles, show that the public is at last awakening to the fact that the exanthemata are preventable diseases. It was thought—and that not so very long ago—that a child's upbringing was not complete until he had passed through an attack of scarlet-fever, measles, and whooping-cough. He was therefore allowed to contract these and kindred diseases by sending him to associate with some friend who was known to be passing through an attack. Wiser counsels prevailed with increasing knowledge, and the necessity for prompt and complete isolation is now recognized in all except the most benighted parts of the country.

Few can read with dry eyes those pathetic extracts from Catherine Tait's narrative of her dreadful experiences in the Deanery at Carlisle; yet no medical man of to-day can read them without thinking what grief would have been spared if a rigid isolation had been insisted upon from the time the first child sickened. The children were rapidly born to a highly intellectual father and a fragile mother. They had moved from a comparatively healthy home at Rugby to the old and insanitary lodgings appropriated to the dean at Carlisle. Chatty, the third child, was attacked with scarlet-fever, which soon proved to be of a most malignant type; yet the other children were merely sent to the far end of the house, whilst the mother, who was in constant attendance upon her child, and was nursing the youngest baby, daily saw the other children and talked with them. Chatty died, and upon the day of her funeral, Susan, the sixth child, sickened of the same disease. The other children remained at home, and there was still free intercourse between them and the attendants in the sick room. The children, indeed, were eventually removed to a house opposite the Deanery, and four days after Susan's death Frances, the fifth daughter, became ill, and she died five days later; yet still there was no interruption to the converse between the house of sickness and the children who had been removed from it. Catty, the eldest daughter, was struck down on the day Frances died, and whilst she was ill May, the second child, sickened. By this time the children themselves had taken alarm, for May's first request when she felt herself ill was, "Keep Cranford away from me; do not let him come near me." Her request was fortunately complied with, and the boy was

removed to a distance from the deadly neighbourhood and from all its distressing surroundings. He indeed escaped with his infant sister; but there still remain the graves containing five little coffins to mark the agony of Easter, 1856.

It is clear that these five children, like so many of the fairest and most precocious, lacked that toxin-destroying mechanism which might have reduced the poisonous effects of the infection. The importance of disinfection and of separation from the surroundings was then unknown, and as one child after the other sickened they were taken into the chamber of death until the first child died less from scarlet-fever than from the attack of erysipelas which succeeded it. Yet nothing that skill or money would obtain was omitted; the best advice was forthcoming. Sir Robert Christison came from Edinburgh, Dr. Goodfellow from London. Tidings from the Deanery were breathlessly awaited throughout England, but preventive medicine was still in its infancy.—*British Medical Journal.*

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THE SPECIAL INFLUENCE OF ALTITUDE UPON HEALTH, DISEASE, AND SANITATION.

By S. E. SOLLY, M. D., Colorado Springs, Col.

When invited to read a paper before this distinguished body, it seemed to me that it would be especially interesting to you as sanitarians to discuss in what respect, if any, a high climate such as you are visiting, differed from the lower climates from whence you came. To answer this question as satisfactorily as our present knowledge will allow, we must briefly recite the known physical and physiological facts in the case, glance at recent experiments, give a summary of clinical experience, draw logical deductions from these facts and corroborated experiences; and then consider how health, disease, and sanitation are modified by altitude.

Looking first at the physical facts, we find there is one element only, but a most important one, which a high climate possesses and a low one does not, viz., diminished barometric pressure. While possessing also in an unusual degree and combination, abundance of sunshine and pure, cool, dry air, yet it shares these more or less with other climates. Much speculation and various theories have been indulged in to explain the effects of reduced barometric pressure. When I first came to live in Colorado Springs, now some twenty-one years since, the solution to the problem was clouded by wrong conclusions drawn by the great traveller and scientist, Von Humboldt. Since then the physiologists have been at work and have given us a sure foundation upon which to lay in their proper order the facts gathered from observation.

With diminished barometric pressure we have, of course, less weight of atmosphere pressing upon the surface of the body, and this for long was thought to be important in accounting for the phenomena, but it has since been shown that as the pressure from the air within the body is equally diminished, and the law regulating the diffusion of gases equalizes the pressure throughout the system, there is no direct practical effect

from diminished barometric pressure *per se.* Then because with the lessened amount of air to each square inch of atmosphere there must also be a diminished amount of oxygen, the conclusion was wrongly drawn that it was therefore the scarcity of oxygen in the air, which accounted for the shortness of breath and the other phenomena of mountain sickness.

As the actual amount of oxygen even at the greatest heights to which man has penetrated, is always in excess of that needed for the blood to carry on its functions nominally, this does not give the answer, which has at last been found to be not lack of sufficient oxygen, but of sufficient proportion of oxygen in each cubic foot of air inhaled. In short, the special effects of altitude are directly produced neither by the reduced pressure of the atmosphere, nor by the reduced amount of oxygen, affecting the lungs and heart, but by the reduction of *oxygen pressure.* When air is inhaled into the lungs, a certain proportion of the total amount of oxygen contained in this air is absorbed by the hemoglobin, which is that element of the blood which is contained in the red corpuscles and whose business it is to absorb oxygen. As each drop of hemoglobin can only take up oxygen in certain proportion to the oxygen pressure of the air, when the oxygen pressure is lowered, as it is in elevated climates, discomfort ensues to the visitor because his blood is not sufficiently oxygenated at each ordinary breath. To remedy this he breathes faster so as to get in more air, and so more oxygen, in a given space of time, and the heart has therefore to pump blood more frequently into the lungs and his pulse beats faster. Such is the temporary remedy, but in time the chest becomes expanded so that more air is taken in at each breath and the heart is stretched, thus its cavities hold more blood and its walls are thickened, so that the muscle has more force to pump this increased amount of blood.

Nature's method of compensating for this deficiency does not stop here, however, and a still more remarkable change takes place and one in which lies the special therapeutic value of high climates for appropriate cases. This change is the increase in the amount of red corpuscles and hemoglobin ; by this the oxygen-absorbing power of the blood is largely fortified in a definite ratio to the elevation.

Some of the experiments which have established these facts will be briefly referred to. Paul Bert on examining the blood of the llama (the Peruvian mountain sheep) found that for every 100 c. c. of blood, it absorbed an average of 20 c. c. of oxygen, while the sheep of the plains did not absorb more than 15 c. c. Viault, Muntz, and others repeated and confirmed these experiments. That the increase in the number of red corpuscles and hemoglobin is due to the diminished atmospheric pressure and not to the other accompanying conditions, was proved by Regnard, who at sea level placed a rabbit under a bell glass and reduced the atmospheric pressure until it was equivalent to an altitude of 9,500 feet. Two bell glasses were used together so that the rabbit could be

changed from one to the other when cleaning and disinfecting was required. The rabbit was kept in this atmosphere for a month and then came out fat and healthy. The examination of its blood showed it absorbed 21 c. c. of oxygen, while under normal conditions its blood and that of its fellows at sea level could only absorb 17 c. c. of oxygen. These changes in the respiratory capacity were completed in about four weeks.

At the congress "Fur Innere Medecin," held at Wiesbaden, April, 1893, Dr. Egger read a valuable paper upon "The Blood Changes in High Mountains." He began by referring to the experiments of Viault, made at Merococha, Peru (altitude, 14,275 feet), upon six persons, in which he found that after they had ascended from sea level and remained three weeks, the number of red corpuscles had increased from five millions to eight millions. He then passed on to detail his own experiments made at Arosa, altitude 5.500 feet, during the summer of 1891, upon twenty-seven persons, twenty-one men and six women. In all these there was a marked increase of blood corpuscles, an average increase of 16 per cent., this being greater among tuberculous than among sound persons. The diet and other conditions were kept the same, and experiments upon nine rabbits showed 17 per cent. increase. The increase was permanent, as the blood was retested in several cases some months later; and, further, the blood of ten natives showed the same average number of red corpuscles, viz., seven millions. Experiments upon six rabbits proved that the increase was not in the capillaries or cutaneous vessels alone, but universal, being found in the carotid and femoral arteries.

He proved, further, that the increase was not due to the drier air of the high ground evaporating the serum and so increasing the blood density, and therefore merely increasing the relative number of corpuscles, but was an actual increase. This was done by withdrawing blood from two rabbits on low ground, at Basle, treating it with the hematocrit, and then three weeks later doing the same experiment upon the same rabbits, after transferring them to the high ground of Arosa. He then found that the per cent. of solid constituents in the blood examined was practically the same on high as on low ground. In five persons while resident in Basle, three men and two women, who were suffering from marked oligocythemia (*i. e.*, scarcity of red corpuscles), there was, after a few weeks' change to Arosa, an increase from five millions to six millions, and their disease was cured. He found also in healthy persons who returned from Arosa to low ground, the number of red corpuscles became normal again in three weeks. With the anemic, while they would lose their increase, they would not fall again below the normal.

He also made experiments for hemoglobin, using Fleischel's hemoglobinometer modified by Miescher. In eleven persons, a month after their transference to Arosa from sea level, he found, without exception, 16.35 per cent. increase of hemoglobin, and the same was shown in three rabbits. He noted, however, that the hemoglobin was increased much

more slowly than the corpuscles, and as this is exactly what takes place after a hemorrhage, when there is a rapid increase of red corpuscles and then increase of hemoglobin, he argues that this is an additional proof that altitude increases the actual amount of both corpuscles and hemoglobin, and is no mere relative apparent increase but a real one.

Muntz by experiments upon rabbits at sea level on the Pic du Midi (9,000 feet) found the specific gravity of the blood was increased by altitude as was also the amount of iron. Viault in 1890 made similar confirmatory experiments upon the Pid du Midi. Egger in closing said the one important factor in the causation of these changes, is the diminished oxygen pressure and that the crucial experiment was made by Regnard, when he proved that, when barometric pressure was *decreased*, the blood's power of absorption of oxygen was *increased*.

At the same congress Drs. Koeppe and Wolf also reported upon the blood changes produced by altitude. Their experiments were made between Leipsig near sea level and Reiboldsgrun, elevation 2,200 feet. They found in experiments made upon healthy and sick persons, and especially among the latter, a marked increase in the number of red corpuscles, a marked reduction of hemoglobin, a striking behavior in the proportion of blood plates and a unique appearance of them, these changes remaining constant after the 8th and 9th day. They found by comparison between several other observers at different altitudes that the number of corpuscles increased in proportion to the elevation. He stated further that the size of the corpuscles is smaller than the old and they are not as rich in hemoglobin. He considers these facts confirm the belief that altitude increases tissue change and is therefore a special value to consumptives. Egger found that during the first twelve days of residence on high ground that while the corpuscles increased 19.72 per cent. the hemoglobin increased only 4 per cent. But in the next twenty-four days while the corpuscles only increased 4 per cent. the hemoglobin increased 8 per cent. As Koeppe's cases were only observed an average of fourteen days, while Egger's were observed for an average of thirty-six days, the evident error of Koeppe's, in stating that the hemoglobin was not increased, is partially explained. His observations were not as elaborate or as precise as those of Egger, and with respect to the increase of hemoglobin are opposed to all other observers and conflict with reasonable deduction.

We see then that the following facts are established, namely: that the peculiar effects of high climates are to increase the amount of red corpuscles and hemoglobin, and the power of blood absorption. The chest expansion is also increased, the latter being admitted by all observers, who also have remarked frequently upon the almost emphysematous character of the breathing, especially at the apices of the lungs of the native-born children and old residents.

With regard to the assumed enlargement of the heart cavities and muscle, no sufficiently precise or extensive experiments have been as yet

made to prove what logical deduction and common belief endorse, viz., physiological cardiac hypertrophy. The remarkable powers of horses raised in high climates to endure prolonged fatigue and great speed, both in their native uplands and also when transferred to the sea level, are matters of common observation and belief. In men, the superior endurance of mountaineers is also well known. This has been noted especially by Hirsch in accounting for the endurance of the natives resident in the high Andes. Further, the results of the treatment of heart disease by the strengthening effect of climbing and high climates, as recommended by Oertel, tend to confirm the belief that the heart is increased both in strength and capacity by altitude. We have then as the special physiological effects of altitude, that is of diminished barometric pressure, greater lung capacity, as shown by the increased chest expansion and more forcible breath sounds, a stronger and larger heart and an increased ability of the blood to absorb oxygen.

For these reasons it may be asserted that there is developed a greater power of resistance to the attempted lodgment of germs within the body, through the increased germicidal character of the more highly oxygenated blood, and through the more perfect working of the lungs and heart. We may also assume that there is an equalizing of the circulation throughout the body and that the tendency to local stagnation of the blood, that is, to chronic congestion, is thereby lessened, while on the other hand the more vigorous circulation would, if by any accident it should be obstructed at any point, cause a more violent local inflammation and a greater general fever and disturbance. This is shown in acute pneumonia. Marching with these effects upon the blood and its circulation and upon the respiration, certain peculiar influences upon the nervous system have been noted but as these matters have not yet been fully worked out, and do not affect the main points of the discussion, we will not refer to them, although we know they greatly modify the influence of altitude.

Turning now briefly to consider how far the results of observations on the effects of altitude upon disease agree with the physiological facts proved and inferred, we find that better results as a rule are obtained in high than in low climates upon all diseases where anemia or any other deficiency of the blood is the most important factor in the sickness, and also in chronic germ diseases such as tuberculosis, provided, of course, that in either case some of the accompanying conditions are not of a nature to be seriously aggravated by altitude. Statistics and experiments have demonstrated that cases of pure anemia, or in which the anemia is the controlling factor, as in most cases of neurasthenia and cases of pure tuberculosis, or mixed tuberculosis without grave complication from catarrhal inflammatory or irritable nervous or cardiac conditions, are as a rule peculiarly benefited by residence in a high climate. As might be expected from the equalization of the circulation referred to, the tendency to hemorrhage is lessened, but when occurring it is often more profuse. Many chronic heart affections and aneurisms are benefited, while on the

other hand in such cases where the disease is too far advanced to admit of improvement, there is great danger in high climates.

Returning to the question of the assumed increase of the germicidal power of the blood, though the physiologist has not as yet proved it by experiment, as they probably will, when they have time to devote to it, certain clinical observations strengthen a belief in its existence, for instance in fevers occurring in high climates such as typhoid, scarlet fever, measles, etc. They are much more frequently of a mild type than in low climates. The symptoms are often so slight as to be unrecognized, showing, probably, that the germs are scanty and well resisted. But alongside with these mild cases are occasionally seen some which are of the most severe type, apparently indicating that when the attack has come from an unusual quantity of germs, or the patient is feeble, that even the especially strong germicidal power of the blood is overcome and the disease progresses uncontrolled, at least in the outset, though if death does not ensue the increased power of resistance usually returns and the convalescence is more rapid and complete than it probably would have been at sea level. This quality of the blood is shown, I believe, in many ways, as for instance in the comparative difficulty in making successful vaccinations, and in the rarity of hydrophobia, in high climates.

Before closing allow me to say a few words upon the effect produced by some of the elements of elevated climates, other than diminished barometric pressure, and which they share in common with certain of the low climates. While there may, or may not be, increased precipitation, there is almost invariably drier air as shown by less humidity both relative and absolute, and usually there is a dry, well-drained soil. The quality or dryness lessens the effect of temperature upon the body by producing more evaporation from the skin and lungs, and therefore affections like sun-strokes are rare. In nervous disorders while neuralgia with anemia is not common, the various myalgiao and dry pleurisies are frequent, and inflammatory and irritable conditions, and disturbances of nervous equilibrium, not rare. As might be expected, the dryness improves the action of the skin, mucous membranes, bowels, liver, etc., in one type of individual while it disturbs it in another. The dry air further increases the nerve tension, and also the electric phenomena of the atmosphere.

In summer warm, dry air by provoking evaporation lessens the injurious effect of the heat upon the body; in cold weather, on the other hand, cold, dry air being a non-conductor, the cold while it chills the surface, does not seem to penetrate to the interior of the body, and the depressing effects of damp cold are absent.

Dry air again interposing but little vapor between the body and the sun, allows it to shine with greater heat and light than in most low climates, and therefore the vivifying effects upon animal life are strongly exhibited, while the air itself being usually cold in the shade, and at night, through reason of there being but little vapor in it to retain the heat, mitigates the injurious influence of over-heat. The dry air with

cool shade and hot sun shine while undoubtedly stimulating to most, induces catarrh, etc., in others.

The increased sunlight and sun-heat with the increased electric tension, and consequent increased ozone, insure a normally pure air, and a more ready destruction of germs when conveyed into it from the bodies of sick persons, or animals, or from garbage or filth. So that it is found that the tubercle bacilli in sputum are more quickly destroyed, and infection more rarely follows, even when the conditions are otherwise favorable for its occurrence. On the other hand out of the body as in it, if for some reason the number of germs are excessive, or the physique depressed, the barriers put up by altitude are swept away, and infection will be sure and fatal as in low countries. So that while it is reasonable to believe from the known facts and logical assumptions drawn from them that at an altitude both the body and the air are better protected against injurious germs, and where present they are usually feebler, and less abundant, yet when the safety line is once past the pestilence will walk, and body wither as surely on the mountain as on the plain. While the mountaineer may trifle longer with the laws of health and sanitation than the plainsman, yet he may go too far and the day of reckoning will come.

In climates high or low the laws of health must be obeyed. To preserve the body in a state of resistance, and to keep the home sanitary, both must be clean, and pure air and sunshine supplied to them. If this is done no other germicides are needed, and infection, and contagion will be rarely found.

Apropos of ventilation and sunlight against disinfection, this story of the coarse but brilliant Abernethy may be quoted. On being asked what he thought of disinfectants which in his day were of the loud smelling order, he replied, "They are a good thing, a damned good thing because they kick up such an infernal stink that you have to open up the windows." So now adieu.

DISCUSSION.

Dr. Henry Sewall, of Denver.—There is only one criticism I would offer on the admirable paper of Dr. Solly, and that is, I do not think the paper should go on record without pointing out that more or less ignorance still prevails with reference to the physiological action of climatic conditions. It seems to me, that one of the most important problems we can consider, or put to a crucial test, is the effect of climate on physiological causes. All the work done by investigators thus far seems to have been largely done at sea level, and since men began to investigate the effect of climate upon the economy wonderful facts have disclosed themselves. It is easy to conduct experiments like those of Paul Bert; but they are a poor test of the constant physiological influence of climatic change. The conditions are infinitely more complex than Paul Bert ever conceived of in his experiments. To those of us who live in a high altitude like this, the question of blood pressure is one of great importance, and arterial blood pressure is the life of the organism, the driving force of the

circulation. That the change in the size and strength of the heart is dependent upon altitude must have been observed by every clinician of experience here. Considering the limited experience I have had in this city, it seems to me there must be a very marked influence of that sort exerted. Again and again have I noticed an increased area of cardiac dulness in cases that have come under my notice, with the apex beat perhaps displaced half an inch, beating outside of the mammary line without any indication of cardiac lesion. This is particularly marked in women.

As to the action of climate on the skin, one author tells us that evaporation is more rapid, perspiration is less, and the activity of the sweat glands is increased, as well as the skin itself. Another says, with sufficiently good arguments, that the action of the skin is decreased.

I have noticed in urinary examinations an enormous proportion of casts. In urines which we would not commonly suspect, I have found hyaline casts of extremely frequent occurrence. One of my professional friends in this city, who is a careful observer, says he has found hyaline casts to be very common indeed. Of course I am simply stating what I have observed, and it is the duty of our colleagues to do the same. I have a case under my care in which there is a continuous abdominal pain, but no rise of temperature. The secretion of the kidneys shows hardly a perceptible trace of albumin; but there is a mass of hyaline, granular, and epithelial casts. If the patient rests in bed for a week, and takes a milk diet, everything disappears except a few casts, showing a rapid response to some condition, which I consider to be due to external influences. What I plead for now, and have done so repeatedly, is individual observation, and it seems to me we can get great benefit from the united support and encouragement of members of this association in our researches. The problems are so complicated, however, that we require individual experience and observation, in order to get at the truth.

I feared very much to come to this climate about ten years ago. I was not quite sure whether it would be the proper thing to do. One physician advised one thing, and another, another. At last, one physician said it would kill me in less than a week if I came. I thought that was as good advice as I could get. So I came. (Laughter.)

Dr. Domingo Orvañanos, of Mexico.—This subject is a very important one, and I desire to say a few words regarding it. In Mexico experiments have been carried on for three years or more by the Medical National Institute, to determine the influences of high altitude upon the physical condition of patients. These experiments have demonstrated that the peculiar effect of high altitude, or climate, is to increase the number of red blood corpuscles and the amount of hemoglobin. In the city of Mexico, for five or six years before the Board of Health assumed control of the sanitary conditions of the city, the mortality was high, but through the efficient management of this board it was materially diminished.

With reference to pulmonary consumption, patients who reside in high altitudes have been cured in the first and second stages of the disease, but as to the third stage I have to express some doubt. The blood of patients has been examined before ascending the mountains, and half an hour after reaching the summit of them, and it has been found that both the red blood corpuscles are materially increased in number, and the hemoglobin in quantity.

Dr. Solly speaks of the frequency of pleurisy here in these high altitudes. In Mexico it is not so frequent. I think the extent to which the American people heat their houses is largely responsible for the frequency of pleurisy.

Dr. Peter H. Bryce, of Toronto.—There are a few questions which Dr. Solly can answer. I have heard it remarked here, and it has been referred to in the doctor's paper, that there still prevails to a considerable extent what we ordinarily call in the East catarrh. It is well known by most of you here that in our lake region and the northern Atlantic coast, as shown by the last census returns of the United States, that diphtheria, leaving out tuberculosis, prevails to an unusual extent in the central states and in New England, and that there is a large percentage of mortality from it. I have, in studying the statistics of our own province, comparing them with neighboring states and the statistics of Great Britain, noticed in connection with this disease variations in prevalence, which lead me to enquire closely as to what, apparently, are the governing conditions of this mortality. I assume that in the Northeastern states and in New England and in Canada we are as far advanced in sanitation as either the West or the South. Some would say further; but the fact remains that we have an increased mortality from diphtheria. In Ireland, a country which cannot be far advanced in sanitation, there is not more than one third the mortality from diphtheria that there is in England, and in the latter country there is not more than one half the mortality there is in Ontario, and in Ontario it is probably less than it is in the neighboring states. Why this is in damp climates under similar conditions, so far as altitude goes, it puzzles me, and I have been led to conclude it is something akin to what Dr. Orvañanos referred to in speaking of the methods of heating our houses. Experiments with the hygrometer have shown under what is known as hot air heating, that the hygrometric condition of the atmosphere is reduced to 50 per cent. saturation; in other words, we have a lessened condition of saturation as compared with the normal. Is it true that these catarrhal conditions are in any degree caused by this abnormal dryness? I would like the doctor to give us his opinion as to whether it is the abnormal dryness which we create in what we may call an artificial atmosphere. If so, it would be interesting to know wherein lies the relation between throat diseases and a dry atmosphere. If it is true that there is a localized congestion in the dry throat, as the result of heating our houses, then I can readily understand how it is that the infection of diphtheria being present, we are more liable to infection spread-

ing from it than we would be in a damp climate like Ireland, where the atmosphere is normal in houses not artificially heated. I would like the doctor to state what his experience has been with reference to diphtheria, its relative prevalence, and its mortality as compared with other countries. I am inclined to think the localized congestions of the mucous tract are the primary cause of infection.

Dr. Carl Weidner, of Louisville.—I would ask Dr. Solly a question. Is it a fact that patients coming to Denver and other places and residing develop not only an increased amount of urine but albumin, and that hyaline, epithelial, and granular casts are present, emphasizing the latter two? From my own observations, I have no doubt that the quantity of urine is increased, but it seems rather peculiar that we should have such an amount from a temporary congestion of the kidneys to account for the presence of albumin. The hyaline casts may be accounted for by the local congestion. The presence of epithelial and granular casts would indicate the existence of a more grave condition.

Dr. Eduardo Licéaga, of Mexico, discussed the paper, and his remarks, as translated by Dr. Formento, were as follows: Dr. Licéaga states a fact that has been observed in Mexico which is of great importance. He says the climate of Mexico should be divided into three classes: (1) That at the level of the sea; (2) along the coast, and above the level of the sea, but below 2,000 meters, and (3) above 2,000 meters of altitude. In the first class of climate phthisis is very frequent and develops very rapidly. In the second class he observes that the disease is slow and curable, while above an altitude of 2,000 meters the disease disappears entirely. He says the disease is due, as we all admit, to a microorganism.

Dr. Graegorio Mendizabel, of Orizaba, Mex., (remarks interpreted by Dr. Formento) called the attention of the Association to the influence of humidity on the development of phthisis. He corroborated the observation made by Dr. Licéaga, and said a striking difference was manifest between towns or settlements of the same level, according to the degree of humidity which existed. He emphasizes the point that the disease predominates on account of dampness or humidity, which combined with heat, is favorable to the development of microorganisms.

Dr. Solly (closing the discussion).—What Dr. Sewall has said is very important, and we can only arrive at conclusions by studying facts. My paper rather dwelt upon foundation facts upon which we could go. But the doctor, I think, is wrong in not appreciating or regarding the experiment of Regnard, which is attributed to Paul Bert. By placing a rabbit under a bell glass he found the exact conditions to diminish barometric pressure, pure and simple, and the result was an increased number in the red blood corpuscles, and an increased amount of hemoglobin. I do not think any experiments could be better, and all the other experimenters have concurred with him.

The experiments referred to by our *confrere* from the City of Mexico are very interesting, but it was impossible for me to bring before you

everything of recent importance. I think even Dr. Sewall must admit that certain facts in connection with high altitude are well established. Of course, there are a great many side issues which are important and need further study. We must largely depend for our knowledge on physiologists and others. We, as practising physicians, are incompetent to carry on this work and we have to depend on others. I do not claim that every person is going to be benefited in coming to a high altitude. I observed, soon after coming here, and spoke of it in my paper, that high altitudes were good for the thin blooded and not for the full blooded, and I think physiological experiments are showing that to be true, as a broad proposition, although I always remember what a professor once said, that "those who generalize tell general lies." So we must be careful not to generalize too much.

Not to detain you too long, I will pass on to the question raised by Dr. Bryce in regard to diphtheria. I have observed—and I think other practising physicians have also—that diphtheria is not uncommon and is apt to be severe, but whether it is specially contagious or not, I am not sure. I rather think it is not; that when it occurs it is apt to be a very virulent and serious disease in the individual. I do not think the contagion spreads to his household as readily as elsewhere. That is my impression. The peculiar virulence of the disease may be due to what the doctor suggests, the peculiar conditions of the upper air passages, possibly to the dryness, and possibly the openings of the glands are wider and more accessible for the invasion of germs. That I do not know, but it has seemed to me a curious thing that diphtheria should nearly always be a serious disease at high altitudes, and yet we know that, as a rule, high altitudes are prejudicial to germ diseases. Of course, the question of diphtheria is complicated since microscopists have shown us the two forms of the disease, the innocent and malignant. When I have seen the mild cases I have been led to think that they were not true diphtheria, and this is certainly one of the problems that lies open to us.

With reference to the question of humidity developing tuberculosis, we of course know that, but we note it more particularly in connection with cold dampness. Dampness and heat, while they cause the disease to develop and increase rapidly and prove fatal more quickly than in a cold climate, yet, at the same time, it is probable that this matter has not been proved, but from my reading on the subject and judging the opinions of climatologists, the disease is not as common in hot, damp climates as in cold, damp climates. When once developed in a hot, damp climate, it is more rapid in its tendency toward death. We are very apt to speak too disrespectfully of humidity in connection with phthisis. I think in connection with pure tuberculosis it is an unfortunate element; but in cases of mixed tuberculosis, where the inflammatory conditions are important it is not a bad element in moderation. And in speaking of consumption being benefited by certain climates we have to consider the peculiar form of the case, but I do believe from twenty-one years' residence here that

pure tuberculosis, pure and simple anemia, are immensely benefited by high altitudes; that when you have a mixed case you consider it from a different standpoint.

Regarding the prevalence of catarrh, I will say that those who come here with it get rid of it, and those who come without it get it. A dry climate stimulates the mucous membrane and dries it up. It prevents irritation in those whose mucous membranes have a tendency to hyperemia.

SUGGESTIONS AS TO OCULAR HYGIENE IN THE SCHOOLS.

By EDWARD JACKSON, A. M., M. D.,
Professor of Diseases of the Eye in the Philadelphia Polyclinic, Surgeon to Wills Eye Hospital.

That education is properly a drawing out and developing the powers of the individual, enabling him to employ them to the best advantage and with the least expenditure of effort, is generally admitted in theory if ignored in practice. Not specific achievement but increased power to achieve is the chief object of the truly educational process. But this is often forgotten, and most completely forgotten as regards visual power and achievement, which enter so largely into the general plan of education.

Much might be said of the failure to develop by proper training the powers of visual observation as a part of the education, primary in time and in importance; but here I wish to speak simply of the neglect of any teaching of the child how to use its eyes to the least disadvantage in the ordinary tasks of the school-room. Not only is it that children are not taught how to use their eyes to the best advantage, with the avoidance of unnecessary strain; but even in schemes for the improvement of ocular hygiene in the schools it is not recognized that they need such teaching.

Much work has been done with the purpose of helping the eyes of school children. But a very large part of it has been merely in the direction of demonstrating that many children's eyes have defects of focus, and the relative frequency of the different varieties of such defects. It has not been sufficiently borne in mind, that whether eyes are perfect or imperfect, whether their defects of focus are corrected or uncorrected, the observance of certain general laws of hygiene and certain special precautions as to the manner of using the eyes will notably increase the extent to which they can be used, and the safety with which they can be used; and will lessen the necessary strain that their use will impose on the general nervous system.

The examinations that have been made and are being made of the eyes of school children have a positive value. It is well worth while that the acuteness of vision, errors of refraction, and general condition of every child's eyes should be carefully studied before submitting them to the necessary strain of school life. While it may not be proper to compel this by legislative enactment, it is a good thing, to be urged on school authorities, and parents, and the public upon all proper occasions. But it is not the only thing worth advocating in the direction of improved ocular hygiene in our schools. We need not feel that until we can do it we can do nothing in this direction. If the proper examination of every child's eyes were brought about, something just as important would still remain to be

done. And this other something we, who in the practice of ophthalmology are most constantly reminded of the dangers of school life to the child's eye, can urge with more evident distinterestedness; and shall find school authorities and parents correspondingly more ready to accept. Then the drawing attention to this phase of the general subject will aid to bring about a better recognition of the other needs of the eye while devoted to school work.

While in the lower grades, every child should be taught how to use its eyes to the best advantage and with the least of effort. To any child that can read, one can demonstrate the increase of effort from holding the thing looked at. Too near to the eye, the possibility of recognizing letters held at a proper distance, the impairment of sight by insufficient illumination, or the unpleasant effects of too great or too sudden changes in the amount of light. The essential facts bearing on the methods and arrangements for eye work can be made clear and reasonable to the child; and they should be so presented early in school life. Then under the supervision of the teacher they should be reduced to practice and enforced until by practice they become habitual.

But, it will be urged, to do this the teachers will first have to be taught. They will have to know something of the principles of ocular physiology and hygiene—matters about which many of them now know little or nothing. One might well hesitate to add anything to the burdens of the over-crammed young woman who now commonly acts as teacher to children of the lower-school grades. But child health (which means race health) and a truer child culture will only be secured under the supervision of those who have some understanding of their essential conditions; and here is a function that takes so large a part in the educational process that it is naturally a point to which attention should be first directed. Then in this case the personal benefit accruing to the teacher from the possession of such knowledge will more than compensate one, who makes much use of her eyes, for the effort to acquire it. Even if one ignorant of the formulated laws of ocular hygiene has usually unconsciously observed them, a conscious recognition of them will prevent many accidental infractions that would otherwise cause discomfort, pain, or exhaustion, the cause for which would remain nnrecognized.

It might, *a priori*, be reasonably supposed that the ability to use the eyes to good advantage, and without injury to those organs or to the general nervous system, would be inherent in the organism or developed during the earliest use of the visual function. Doubtless for the untrained, undisciplined child, the natural feelings of discomfort and weariness would be quite sufficient to overcome its undeveloped power of application, and check ocular effort or turn it into new channels before it became seriously harmful. But the power of application that makes the successful student is the power to follow continuously the one train of thought, or the one series of sense impressions, to the complete disregard of all sensations or ideas that would interrupt it. And among the sensations that

are thus habitually disregarded are those of weariness and disinclination to continue the appointed task, that constitute the natural instinctive checks to over-use of the eyes. It is this laboriously acquired power and habit of concentration upon the subject in hand, to the disregard of the instinctive limits of endurance, that makes it necessary to replace these limits of instinct by limits of reason—to use conscious care in fixing the requirements laid upon the eyes, to replace the unconscious guardianship of them by natural sensations and impulses.

The practical point urged for recognition is, that the education of the teacher must include a practical working acquaintance with ocular physiology and hygiene—the proper conditions for eye-work as to posture, distance, illumination, hours of work, etc., and a knowledge of what are fair limits of safe requirement. Of course it may be wise or necessary to supplement the teacher's knowledge with expert counsel when this is available; but no amount of consultation or occasional supervision will meet the needs for constant intelligent care and oversight in the arrangement of tasks, the shading of the room at different hours and on different days, or the correction of bad positions of the scholars, as these needs arise.

One other point I wish to bring up, not new but still imperfectly understood, namely, the lighting of the school room. It ought to be more generally recognized that during school life all eyes are severely taxed. Under the strain a certain portion will break down absolutely, a certain other portion continuing the work will be noticeably and permanently injured, another portion will do the work without noticeable permanent injury but with periods of discomfort and pain, and all would be better off if their required expenditure of vital force for eye-work could be lessened. And it should be remembered, that short of direct sunlight shining on a light or reflecting surface, no illumination of the object look at, can be too strong; but that with this single exception, the more light, the better.

In regard to the matter of illumination, much has been said of the ratio of window space to floor space, and of a minimum allowable proportion of the former to the latter; and the proper minimum has been variously estimated at from 1.20 up to 1.1. But such a standard has no practical value. It is not to be compared to standards of minimum air space or minimum water supply. If a standard is needed it should be based, not on window space, but on the extent of clear sky always available from the darkest part of the room, at which will be placed a book or other object to be looked at; taken in connection with the angle at which the light from such sky space can fall upon the book or other object. Mere window space that does not give access to open sky answers very imperfectly the requirements for illumination; and the angle at which the light strikes the surface to be illuminated is just as important as the extent of sky space or the intensity of the light.

In any building with large rooms, the difficulty is to get window space high enough to admit light at an effective angle. In every case the win-

dow should extend entirely to the ceiling, and its upper portion should be so arranged as always to be available for purposes of illumination. When the exposure of a window is such that during some part of the school day the direct sunlight would enter through it, causing light areas on the floor or lower walls and so impairing the practical illumination, its upper part should be set with ground or fluted glass that can intercept these direct rays, and by diffusing them to the darker parts of the room improve the illumination. The size and fitting of the upper part of the window is a point for special attention in securing light for the school room, but it is not the only point of importance. Indeed, the only safe practical rule to follow with regard to the illumination of a school building is, to so place and plan it as to secure the greatest amount of daylight possible. Until they can be wholly constructed of materials that will freely transmit light, the amount of opaque wall entering into such structures should be reduced to the minimum compatible with stability; and the disposition of the wall should be such as to allow the freest possible ingress of light.

Briefly to recapitulate: It is urged that in the discussions about ocular hygiene in the schools, not enough stress has been laid upon the following points:

The child should be early trained to use its eyes to the best advantage.

The supervision of the work of the school room, as to the pupils' manner of using their eyes and certain other important requirements of ocular hygiene, should be constant rather than occasional.

In the matter of the illumination of the school room the proper aim is to secure as much light as possible; and the ratio of window space to floor space does not furnish a standard of practical value by which to judge the sufficiency of the illumination secured.

These points have been briefly presented, that they might make the smallest claim on the time of those who have given some attention to the subject of ocular hygiene in the school room; but they are each worthy of more extended presentation, and capable of convincing support.

DISCUSSION.

Dr. R. H. Lewis, of Raleigh, N. C.—There is really very little to discuss about the excellent and practical paper of Dr. Jackson except to endorse it and to make one suggestion in regard to the position of the child in writing. There is a new system of writing introduced known as the vertical. Children in writing are very liable to bend over, thus getting their faces and eyes too close to the paper. The eyes are brought too close to the object. The advantage of the vertical system of writing is this, that it is impossible for a child to write without sitting in the upright position in spite of himself. This is the practical value of the system. I heartily endorse the paper and simply wish to call attention to that one fact which I regard of practical value.

Dr. J. M. Watson, of Elizabeth, N. J.—The question for our consideration is of the utmost importance, suggesting certain things, without

preferable methods, for the use of the eye. I apprehend that very few understand how to use the eye, and that nature must be aided in order to use it wisely. For example, one who is accustomed to walking in the streets of our great cities soon learns to see everything on each side of the street above and below without seeming to see anything. The ability to take in many objects at once, to see what is above and around us, should enter into the early training of children in learning to read and write, in studying their text-books. The eye should be trained to take in many objects at once. If there is any objection to such training I would like the essayist to specify what it is. We have heard something as to windows and the importance of having rooms well-lighted. The eye is only a window. It is the mind that sees, and the well-trained mind can see with comparatively slight use of the eye. That also should be considered. It is my impression that nine tenths of the people use the eye much more than is needed. It is the habitual use of the eye wisely that we need to consider in connection with school training.

I simply make these remarks to call the attention of the gentlemen who read the admirable paper on this subject to some practical suggestions, and I hope, in closing the discussion, we shall hear whether there is any objection to a training that gives a wider use of the eye instead of looking at single objects.

Dr. Henry D. Holton, of Brattleboro, Vt.—For quite a period I was a school director, and found several years ago that the younger children in the lower grades were suffering with their eyes. I knew it was not because the room was not properly lighted, and I commenced to investigate. I found the trouble was largely attributable to our modern system of education. A great deal of the work is put upon the blackboard, especially figures, for the very young children, and they are instructed to copy them on pads of paper. The result was that the child looked across the room at the figures on the board. There was one focus, and immediately the child would look back, which is another focus, and put down the figures. Consequently the child was constantly getting two focuses, a distant and a near one; the eye became tired and permanently weakened. I do not think that our school directors or teachers know what the effect of these two focuses is. I at once had put into each school a set of printed tables, which was given each child to copy from the table to the slate, so that the focus was the same, and we have not had the small children's eyes affected since, and have not used artificial aids to any extent since then. I am satisfied that was the trouble, and our school directors ought to have their attention called to it.

Dr. Watson, of New Jersey.—I would ask the gentleman if that is not objectionable; instead of training the eye to take in the necessary objects, he brings these objects before the eye at a near point.

Dr. Holton.—I think the trouble does not come from the child looking off at a distance and having a long focus, but the trouble largely arises from the long and short focus.

DR. WATSON.—Why not train the child to take in at a glance the objects necessary?

DR. HOLTON.—When you have a column of figures for addition, the child can take in say 25, 75, and 10 at a glance and put them down. He could not do this so well in copying from a blackboard.

DR. WATSON.—I think it can.

DR. HOLTON.—I doubt whether it can be accomplished by children in the third grade of a school.

DR. A. G. YOUNG, of Portland, Maine.—I would remind the gentleman that figures, as they are usually put upon the blackboard, are harder to read than printed figures, or even figures made with pencil, for the reason they may be larger, the angle of vision is smaller or narrower; and there is another objection to reading figures on the blackboard. Blackboards are not what they ought to be—at least, many of them. The figures are not plain, the surface is smooth and glistening, and light does not fall upon it at the right angle. The proper position for blackboards is opposite windows. The blackboard then should be on the other side. It has been observed that studying exercises from the blackboard is more trying to the eyes than any other kind of work.

DR. HOLTON.—I will say that in two of our school buildings the blackboards are so situated that the light comes always into the rooms either from the back or over the left shoulder.

DR. S. H. DURGIN, of Boston.—I was pleased to hear the paper of Dr. Jackson, and I am induced to ask him if he does not think it would be well to make a local inspection of schools, one which should develop the fact as to the capacity of each child for seeing at a distance, and make that a basis for instructions which may be given to the teachers. I have been considerably interested in this matter in my own city, and it is a part now of our program. I have on foot, and which I am to allude to briefly to-morrow in a paper, the inspection of the children to see what their capacity is. I find that in our schools one class of children may be required to read figures or letters at a distance. It is the same with the hearing, a class of children are required to do certain work. A number of children are perfectly capable of using their eyes at a distance for a given time, while another class are entirely incapable of doing the same amount of work. The teachers may be ignorant of this fact, and it has seemed to me it would be a wise plan to give the teacher a knowledge of the capacity of each child in seeing at distances and the length of time which they should use the eye.

DR. HENRY M. BRACKEN, of Minneapolis, Minn.—It so happens, Mr. President, that a matter bearing on this subject was brought up in the Minneapolis Academy of Medicine by Dr. Allport, of Minneapolis. Possibly Dr. Jackson will remember the paper. If he does, I would like to hear an expression from him regarding it. Dr. Allport stated that it was impossible for many poor children to be examined by physicians, that is, those who attend the public schools. His idea was that the teachers

should be so instructed that they can make certain tests and determine whether there is eye strain or other trouble noticeable, and if so, directions should be given to send them to a physician. This matter was taken up by President Northrop of the State University, and at the teachers' meeting held at the University during the summer, Dr. Allport was instructed to give the teachers instruction on this subject. No official action was taken.

Dr. Jackson (closing the discussion).—I think in the course of my paper I mentioned the subject of training as to visual observation. That, I think, was alluded to by Dr. Reed, of Montreal, at the Montreal meeting of this association. He spoke of the plan proposed by Carter of having a table covered with a number of objects, a cover drawn over them, then taking the cover off for a certain number of seconds and by computation stimulating the children to observe the greatest possible number of objects they could on the table; to repeat them or write them down afterwards. There are other plans of doing the same thing. We should use the eyes so as to conform to physiological laws, and use them with the least effort in the matter of focussing and of distant objects, teaching them how they can do the best with them. That point I wish to call attention to particularly, and it has always seemed to me best, in a paper read before a body of this kind, not to introduce too many points. So I purposely omitted the more technical, strictly practical rules, as to how the eyes should be used.

With reference to illumination, there is just one point that I would like to remind you of, and that is the illumination of the object looked at. The more light you get from it the better, except the direct sunlight falling on light objects. Of course, we have considered the illumination of that part of the room that the child is not looking at. The greater that is, the more the pupil is contracted, and less light comes on the object looked at. More light on the object looked at, and the less possible other light, is what ought to be aimed at. It is on account of the other light that blackboard work is harder on the eyes. All blackboard work, even with the best of blackboards, is harder to see. It is more difficult to observe figures on them than even the poorest letter press. I notice that one of the principal obstacles in the use of the blackboard is the reflection that comes from the surface. In papers, especially highly calendered papers that are used for half-tone print, the polished surface causes a reflection which does not make the letters any more distinct, but is in the nature of an outside light which impairs illumination rather than improves it.

With reference to the question of the examination of individual children, it seemed to me, when I was preparing this paper, that that phase of the subject had relatively received more attention than certain other things which were just as important. I do not want to underrate the examination of children's eyes and their ears and other physical powers. I think it is one of the most striking anomalies of our school system, that a child should be carefully examined as to the studies it has previously pursued and the

standing it has had in former years, as to whether it is fit to go into a certain grade. In observations made as to sight and hearing, this anomaly, if attention is called to it, cannot long exist. It is just as important that those things should be looked after which affect all the children that go to school, or all that are in a certain room and are exposed to light and have certain tasks to perform, as it is the individual powers of the children, and they should be brought to the attention of the school authorities.

I have read Dr. Allport's paper that has been referred to, and it is in the direction of the work that should be done, teaching the children more about the eyes. It is the quickest way in which we can bring about individual examinations, enabling the teachers to make rough examinations.

In the matter of examination of railway employés, the system which has been most widely adopted is the one which enables the superintendent or the yardmaster, whoever is in charge of the men, to make the examination and report his results to the expert. This system has been far more widely adopted than any other, to my knowledge, for testing color blindness, and a system by which our teachers can be made to make rough examinations will be adopted much sooner than what we may regard as an ideal one, where each school shall have its medical expert.

Dr. James A. Stewart, of Baltimore.—Would it not be a good idea to substitute for the present blackboard a blue-ground board? Chalk will show just as well on a blue-ground board as it will upon a blackboard. However, the blackboard has been so long in use that it seems to be a fixed factor. I see no reason why a blue should not be substituted for a blackboard. It certainly would be less injurious to the eyes. I would like to ask Dr. Jackson whether a blue color would not be less injurious to the eyes than a real black.

Dr. Jackson.—I do not know that the color would be of very much importance. I think the chief defect of a blackboard is the regular reflection from its surface. If a change can be made in it, it is the change of surface. If we can secure a black surface which is entirely dead that will take chalk freely and give no reflection at any time, we would be in a measure redeemed. Without the perfectly dead surface, I think even a blue color would be objectionable.

MEDICAL INSPECTION OF SCHOOLS.

By S. H. DURGIN, M. D.,
Chairman Board of Health, Boston, Mass.

It will be remembered that in my address at the Chicago meeting in 1893, I briefly discussed the question of daily medical inspection of public schools as a means of lessening the spread of contagious diseases among school children, and of giving timely professional advice to the teachers concerning children who might be too ill to remain in school for the time being. I had for some time then been trying to inaugurate this work in the Boston schools and only succeeded in placing the machinery in motion on Nov. 1, 1894.

It is my purpose to give in this paper only a brief statement of how this work is being done, the result of the first four months' work and the impression which the work has made and especially upon the school management.

The city was divided into fifty school districts, giving an average of about four schoolhouses and 1,400 pupils to each district. One physician was appointed by the board of health for each district with a salary of $200 a year. His duty is to make a visit to each master's school daily soon after the beginning of the morning session. The master receives from each of the teachers in his district early reports as to the appearance of symptoms of illness in any pupil under their charge. These reports are given to the visiting physician, who at once examines the reported children and makes record of his diagnosis and action in books furnished by the board of health for the purpose and kept in the custody of the master. If the visiting physician finds a child too ill to remain in school, he advises the teacher to send the child home for the observation and care of its parents and family physician. If the illness is from a contagious disease, the child is ordered home and the case reported to the board of health.

If a child who is thus sent home returns the next day with continued illness the same action by teacher and physician will be repeated and sustained by the health and school boards.

I shall be able to give the exact data for only the first four months of the work, comprising the months of November, December, January, and Febuary and to avoid repetition I will quote from the recent report of Edwin P. Seaver, our superintendent of public schools, his expressions of approval of the work, in connection with the data which I furnished him at his request. He says:

"Only favorable reports have come to me concerning the operation of the plan by which the board of health has been carrying on a system of

daily visits in all the schools by competent and disinterested medical men. The board of health appears to have been highly fortunate in the character of the professional men it has secured for the work. Some of the best medical talent in the city has been engaged in this service. The medical visitors do not undertake to give professional treatment in any case. They examine all children thought by their teachers to be ailing, and point out the need of professional treatment in all cases in which the need exists. The treatment itself must be received from the family physician or in the hospitals or in the dispensaries. Some idea of the extent and importance of the work may be gathered from the following statistics which have been kindly furnished me by Dr. S. H. Durgin, chairman of the Boston Board of Health:

'The total number of children examined during the four months ending February 28, 1895, was 9,063, of whom 5,825 were found to be sick, and 3,238 were found not to be sick. The number found sick enough to be sent home was 1,033; of these 280 were suffering from contagious diseases, as follows: Diphtheria, 58; scarlet fever, 19; measles, 42; whooping cough; 17; mumps, 35; pediculosis, 47; scabies, 33; congenital syphilis, 7; chicken-pox, 22. These children were in their seats spreading contagious diseases amongst other children. The number of children who were saved from these diseases by the timely discovery and isolation of the sick children, is of course beyond computation.

The other diseases discovered and for which the necessity for treatment was pointed out, were as follows: Abscess, 22; adenoids, 59; catarrh, 244; cellulitis, 12; cholera, 11; colds, with more or less bronchitis, 224; debility, 63; diseases of the eye, 389; diseases of the ear, 35; diseases of the skin and scalp, 186; diseases of the throat and mouth, 3,489; epilepsy, 5; fracture of collar bone, 1; headache, 171; indigestion, 42; malaria, 17; nausea, 50; Potts' disease, 3; swollen glands, 74; ulcers, 16; wounds, 21; miscellaneous diseases, 411; examined for vaccination, 117.

The summary statement is as follows:

Total number examined		9,063
Found to be sick	5,825	
Found not to be sick	3,238	
		9,063
Number found sick enough to be sent home		1,033
Nunber found well enough to remain in school		4,792
		5,825

I believe that the importance of this work of medical visitation thus successfully begun can hardly be overestimated. So far as I know, Boston is the only city in this country where work of this kind has been undertaken. It is to be hoped that the efforts of the board of health

may be heartily sustained by the School Board and by the general public.'"

I will say that incidental to this school inspection, this corps of medical men is also serving an excellent purpose in the control of contagious diseases. The board of health sends to each one of these school inspectors every morning a full list of the cases of diphtheria and scarlet fever which have been reported in the previous twenty-four hours. Each medical officer picks out the cases reported in his district, visits them to see if they are properly isolated at home, and reports the facts at once to the board of health for its action. He makes another visit to the patient on the question of discharge from isolation and again reports his conclusions to the board of health. This medical officer is indirectly held responsible for the proper isolation of the patient at home, for causing the patient's removal to hospital when necessary, for the patient's release from isolation; in other words the board of health is enabled to act upon trustworthy information, and relieve the medical attendant of one of his most unpleasant duties.

This corps of physicians has been organized into a society; meet at regular intervals and discuss only questions pertaining to their official work. There is no difficulty in securing first class medical men for this work, but it should be said in their behalf that in many instances the salary is more than equalled by their desire to take part in the new work, with which they are in full sympathy.

The work is now very generally approved by the medical profession, by the school teachers, and by the community at large.

For the sum of $10,000 a year the teachers and 70,000 school children have the benefit of well selected medical oversight and the board of health is provided with trustworthy medical agents in every part of the city for the prosecution of its work.

DISCUSSION.

Dr. Wm. P. Munn, of Denver.—As emphasizing the importance of what Dr. Durgin has already systematized in the schools of Boston, I desire to add two cases in which the bacteriological examination, added to such inspection as he has spoken of, has been of great assistance. In a home where forty children were exposed to an outbreak of diphtheria, two cases being recognized clinically, all the throats of the inmates of the home were examined bacteriologically. All children were found to be free from diphtheria bacilli, but one of the servants, a woman seventy years of age, had diphtheria bacilli in her throat. She was removed to the hospital with the two affected children. Two out of forty specimens examined were found to contain diphtheria bacilli, although the children exhibited no evidences of the disease. There were no subsequent cases. When diphtheria bacilli are found in the throats of children, it is well to remove all of them from school, and then there

will be an end to the further outbreak of diphtheria which they would otherwise cause.

Dr. Watson, of New Jersey.—I would ask the gentleman, who read the paper, whether the examination is intimately connected with such steps as are remedial. For instance, do the examiners have anything to do with prescribing physical exercise for the pupils with reference to their physical needs, as I think some benefit may be derived from suitable physical culture.

Dr. John H. Jamar, of Elkton, Md.—I want to add one word to what has been said by Dr. Durgin to emphasize the necessity and importance of inspection of schools with reference to the detection of infectious or contagious diseases among the pupils. Although we have no special law with reference to that matter, so far as schools are particularly concerned, in a number of the counties of our state we have established what we might call an unwritten law among the school districts. We have what is called vaccinating physicians in each district of the county, and upon them rests the responsibility of looking into the condition of the pupils in the various schools, especially with reference to their effectual vaccination, aud to discover the presence of infectious or contagious diseases which may exist among the pupils also. The teachers are instructed to report to these "vaccine physicians," so-styled, in cases of indisposition on the part of the pupils in their schools, and then these physicians are required to visit the schools to discover what the nature of the malady is. If it proves to be an infectious or contagious disease, the pupils so affected are immediately ordered home, and the cases isolated as far as possible. Usually, a regular medical attendant then takes charge of the case. With all the educational institutions in my own district, that is the rule we have universally adopted. The teachers are authorized and instructed to inform us whenever a case of indisposition occurs in their schools among any of the pupils. I then take the case under my supervision, and if it proves to be an infectious or contagious disease, the parents are instructed to keep the child or children at home until the prescribed time, when all danger of disseminating the disease shall have passed. It is an important point and should be carefully considered by the school boards in the various counties of the different states.

Dr. Durgin (closing the discussion).—I would say in relation to the bacteriological tests, that I purposely made my paper brief; there is much that I might have said in regard to that. Each of the medical inspectors, when he suspects a case of contagious disease, particularly diphtheria, follows it home to determine that fact, bearing in mind all the time that he is not to give offense by interfering in any way with the rights of the family physician. We furnish culture tubes in drug stores in different parts of the city where any physician can get them for culture purposes, use and return them, and he will receive from our laboratory an answer the next day as to the character of the culture.

In regard to the examination of the pupils' eyes, the board expects to take up this work when it can be arranged with the school committee so as to make the innovations without offense. We shall have the examinations of the eyes conducted upon a uniform plan to be laid out by specialists. The same is to be done with the ear and with the spine.

In regard to vaccination, our men are doing many vaccinations for the poor children and issuing certificate of vaccination for the teachers' use. We have also a central office where all poor children can go and be vaccinated and receive a certificate of vaccination, which is required for the admission of any child to a public school.

BACTERIOLOGICAL RESULTS FROM MECHANICAL FILTRATION.[1]

By GARDNER T. SWARTS, M. D.,
Secretary State Board of Health, Rhode Island.

At the last meeting of this Association at Montreal, the statement was made in the report of the Committee on Water Supplies that no data had been available to show that filtration by the so-called mechanical methods was successful in removing bacteria. The writer at that time referred to experiments which had been made in the city of Providence, R. I., in order to determine this question for the purpose of establishing a plant capable of filtering 15,000,000 gallons daily, if the experiments were successful.

The figures showing these results were not at that time available and as they have never been published, and as no experiments of a similar character have been made, it seems desirable to place these facts before the Association inasmuch as many municipalities are agitated over the advisability of introducing the so-called natural or sand-bed filtration or mechanical filtration.

The mechanical form of filter used in the experiments was of the type in which quartz or sand is used as a supporting bed to a film of precipitated coagulant fixative of organic matter, produced by the introduction into the water before filtering of some chemical such as iron or alum; a filter which also is cleansed by means of a reversed current of the water passed through the filter assisted by the use of a rake made to revolve in the bed of quartz while the washing is being done.

The filters used in this line of experiments were two of the natural sand-bed form, imitating the usual filter bed. The mechanical form was represented by one of the New York Filter Co.'s filters and one of the so-called Morison filters. After the first seven months the sand filters were discontinued, it having been satisfactorily ascertained that the length of run was much less than the mechanical filter before the bed became clogged, and the rate of flow in the natural bed was but 30,000,000 gallons per acre in 24 hours, while the mechanical filter was run at the rate of 125,000,000 per acre in 24 hours. The efficiency of removal of bacteria was not as high, and the results were variable either as the result of cracks in the filter or from some unknown reason. Although both of these natural filtration beds were constructed exactly alike, the results from the second were much poorer than those from the first. When the

[1]Abstracts from a report made by E. B. Weston, C. E., of Providence, R. I., upon experiments made by natural filtration and in the use of the Morison filter for period of nine months.

natural bed was transformed or assisted by the addition of alum, thus converting it into a mechanical filter, the removal of bacteria was increased to nearly the same as on the Morison filter, but the length of the run was correspondingly decreased. The sand used in the natural beds was a natural river sand, not over sharp, while the sand used in the mechanical filter was crushed quartz having sharp edges.

In the beginning of the experiments the New York filter gave such varied and unreliable results that its use was abandoned, while the so-called Morison filter was continued in use during the whole series of experiments which lasted for a period of about ten months, the working of the mechanical parts of the filter being perfectly satisfactory and the results obtained being successful.

The filter bed used in this mechanical filter was two feet, ten inches in depth, supported upon a base of iron with circular perforations of about four inches in size which were covered with screens. The crushed quartz used was the "effective size" of 0.59 millimetres. The filter was washed by a reverse current which caused the quartz to boil. The agitation and friction of the particles were increased by means of a rake with long teeth which revolved about a central column in the filter; the rake penetrating the bed by a screw motion from top to bottom.

From the various kinds of coagulent or precipitant used, basic sulphate of alumina was selected as being the most satisfactory and effective and was used in all the experiments mentioned. The amount of alumina used was one half grain to the gallon of water filtered, a lesser quantity failing to satisfactorily remove the organisms while the amount of three fourths of a grain per gallon did not increase the removal of the bacteria, while the efficiency of the filter was greatly decreased by reducing the amount of the flow through the filter bed.

The alum was applied in a free flow at the beginning of a run by pouring into the filter, as the water entered, a pint of the coagulant containing about 911 grains of sulphate of alumina for an average flow of 128,000,000 gallons per acre. The solution was made by adding one part of the alumina to six parts of water; as a result of this addition there forms a white flocculent precipitate over the surface of the grains of quartz and is the actual medium through which the filtration takes place, the quartz serving merely as a supporting bed or sieve. It required about six minutes to form this layer. When applied at the rate of a drop at a time and not in a "free flow" it required about a half an hour before the filtering layer would be formed. As soon as the filtering layer was formed the alum solution was dropped in continuously during the run from a regulated stop at the rate of a drop a second. The effect of the presence of this layer was to reduce the head or pressure .28 of a foot for 128,000,000 gallons per acre. The depth of the water above the bed at the commencement of the run was nine inches; the average length of the run was about eighteen hours.

Under these conditions it was determined how long after the commence-

ment of the run the filtering ability was at a maximum and also the capacity of the filtering media to remove organisms and also the possibility of removing organisms foreign to river water and simulating pathogenic bacteria in their life history. In this last experiment the Cruikshank bacillus and the bacillus prodigiosus were used, since from their chromogenic properties they could be readily distinguished from the water bacteria.

For an understanding of the proportion of bacteria found in the applied water and the number to be found in the filtered water, table No. 3 of the report is here appended.

TABLE NO. 3.

FILTRATION EXPERIMENTS.

Morison Filter.

Growths of about ninety hours of water bacteria in the samples of applied and filtered water, which were taken at the same hour, which was one hour or more after water commenced to flow from the filter.

DATE.	Gallons of water filtered per acre, per 24 hours.	BACTERIA PER CUBIC CENTIMETER.		Per cent. of the applied bacteria removed.	Average percentage of the applied bacteria removed.	Grains of sulphate of alumina used per gallon.
		In applied water.	In filtered water.			
1893.						
July 20	125,000,000	2,000	11	99.5		0.75
21	122,000,000	9,477	16	99.8		0.90
Oct. 3	125,000,000	905	6	99.3		0.60
4	128,000,000	610	2	99.7		0.58
5	131,000,000	4,002	25	99.4	99.5 (By totals, 99.6)	0.55
17	125,000,000	6,175	26	99.6		0.57
27	122,000,000	9,700	41	99.6		0.61
30	128,000,000	1,700	7	99.6		0.56
31	131,000,000	400	9	97.8		0.59
Nov. 1	132,000,000	15,112	19	99.9		0.61
2	123,000,000	6,950	26	99.6		0.81
3	122,000,000	9,400	50	99.5		0.84
4	132,000,000	3,400	63	98.1		1.20
9	125,000,000	2,200	26	98.8		0.60
11	125,000,000	3,650	25	99.3	99.2 (By totals, 99.5)	0.82
Commenced to use Bacillus Prodigiosus.						
Nov. 23	120,000,000	15,850	218	98.6		0.60
24	132,000,000	7,600	364	95.2		0.59
Dec. 2	128,000,000	4,900	190	96.1		0.75
4	128,000,000	4,475	91	98.0		0.60
1894.						
Jan. 2	132,000,000	2,150	94	95.6		0.85
3	137,000,000	2,000	118	94.1		0.84
4	134,000,000	2,275	44	98.1		0.85
5	130,000,000	1,925	60	96.9		0.82
8	130,000,000	2,375	184	92.3	96.1 (By totals, 96.9)	0.58

TABLE NO. 3.—*Continued.*

Ceased to use Bacillus Prodigiosus.

Date.	Gallons of water filtered per acre, per 24 hours.	Bacteria per Cubic Centimeter.		Per cent. of the applied bacteria removed.	Average percentage of the applied bacteria removed.	Grains of sulphate of alumnia used per gallon.
		In applied water.	In filtered water.			
Jan. 9	130,000,000	1,850	54	97.1		0.60
10	134,000,000	800	28	96.5		0.84
11	130,000,000	750	20	97.3		0.61
12	132,000,000	350	52	85.1		0.81
13	132,000,000	600	36	94.0		0.72
15	134,000,000	925	88	90.5		0.84
16	134,000,000	375	44	88.3		0.58
17	130,000,000	2,150	64	97.0		0.82
18	134,000,000	1,500	62	95.9		0.59
19	136,000,000	1,450	80	94.5		0.83
20	130,000,000	2,800	58	97.9		0.72
22	132,000,000	3,350	62	98.1		0.85
23	132,000,000	2,300	64	97.2	94.6 (By totals, 96.3)	0.80

Washed filter bed with Caustic Soda.

Jan. 24	128,000,000	2,100	6	99.7		0.60
25	125,000,000	2,225	18	99.2		0.82
26	128,000,000	4,650	54	98.8		0.58
27	128,000,000	4,875	72	98.5		0.58
29	128,000,000	1,575	82	94.8		0.59
30	130,000,000	1,400	28	98.0	98.2 (By totals, 98.5)	0.58

As a result of the whole series of experiments the total shown in table No. 9 will give an idea of the averages. In consideration of this table it must be remembered that the introduction of only one result which may be far below the average will readily reduce what would otherwise be a most favorable average to a lower point. This one result might occur from a temporary contamination of the effluent pipes at the time of collecting the sample, and which might not represent the exact results of filtration.

TABLE NO. 9.

Summary of the average percentages of applied water bacteria which were removed in passing through the Morison Filter, determined from samples of filtered water which were taken one hour or more after water commenced to flow from the filter.

Remarks.	Samples that were taken the same hour as the applied water.		Samples that were taken one hour or more after water commenced to flow from the filter.	
	End growths.	Growths of about 90 hours.	End growths.	Growths of 85 hours or more, and end growths.
	Total No. 5	Total No. 5	Total No. 5	Total No. 5
Counts July and Oct., 1893.	99.5 (99.6)	99.5 (99.6)	99.5 (99.6)	99.5 (99.6)
	Total No. 10	Total No. 10	Total No. 12	Total No. 16
Oct. 17 to Nov. 11 and 18, 1893.	99.0 (99.4)	99.2 (99.5)	98.6 (98.8)	98.8 (99.1)
	Total No. 9	Total No. 9	Total No. 35	Total No. 128
Nov. 23, 1893, to Jan. 8 and 9, 1894. Bacillus prodigiosus used.	95.9 (96.8)	96.1 (96.9)	96.1 (96.9)	95.9 (96.7)
	Total No. 13	Total No. 13	Total No. 58	Total No. 58
Jan. 9 to Jan. 23, 1894.	91.2 (94.3)	94.6 (96.3)	92.8 (95.2)	92.8 (95.1)
	Total No. 6	Total No. 6	Total No. 18	Total No. 18
Jan. 24 to 30, 1894. After washing with caustic soda.	98.3 (98.5)	98.2 (98.5)	98.8 (98.9)	98.8 (98.9)
	Total No. 38	Total No. 38	Total No. 123	Total No. 220
Average of all the above from Oct. 17 to Jan. 30.	95.4	96.7	96.0	95.5

TABLE NO. 9.—*Continued.*

Remarks.	Samples that were taken the same hour as the applied water.		Samples that were taken one hour or more after water commenced to flow from the filter.	
	End growths.	Growths of about 90 hours.	End growths.	Growths of 85 hours or more, and end growths.
	Total No. 16	Total No. 16	Total No. 30	Total No. 34
Average from Oct. 17 to Nov. 11 and 18, 1893, and from Jan. 24 to 30, 1894.	98.7	98.8	98.7	98.8

During the application of the cultures of bacillus prodigiosus on large quantities suspended in the nutrient media, the members of the common water bacteria materially increased in the effluent, the particles of quartz becoming covered with a slimy brownish deposit. Unsuccessful attempts were made to cleanse the quartz of this growth by steaming and boiling the quartz for one hour. Formerly the application of a solution of one pint of caustic soda to twenty-four parts of water and steaming, the normal white color of the quartz returned; the efficiency of the filter was raised by this process of cleansing from 92.8 per cent. to 98.8 per cent. As to the mooted dangers attending the use of alum in the applied water and which is held up as a warning by the opponents of mechanical filtration, this much may be said in reference to this series of experiments:

While it was found necessary to add half a grain of sulphate of alumnia per gallon of water filtered in order to obtain the most satisfactory results, yet upon comparison by the most careful chemical tests of the water, applied to the filter and that of the effluent, there was found to be less alum in the filtered water than in the river water itself.

Inquiries from numerous manufacturers using alum as a precipitant in various quantities in excess of the amount used in the experiments, revealed in no instance any incrustation or scaling on the tubes of the boilers where such filtered water had been used.

Communications with the various boiler insurance companies elicited no report of scaling where such water was used.

There is no recorded instance where the use of alum-treated water as a drinking water has produced any ill effects upon the consumers.

This work was done by the order of the city council of the city of Providence, and under the direction of a commission consisting of the superintendent of health, the city engineer, and the commissioner of public works. The immediate supervision of the operation was under the super-

vision of Dr. C. V. Chapin, the superintendent of health, and a member of this Association, while the application of the various tests was made under the direction of Mr. Edmund B. Weston, C. E., from whose compilations and reports these abstracts have been taken. Most of the bacteriological work was done by the writer.

Inasmuch as the writer, as well as every person connected with the experiments, commenced the investigation with the firm belief that successful mechanical filtration was not possible from a bacteriological view, it must now be stated after examination of these figures, that mechanical filtration under these conditions can be firmly endorsed.

DISCUSSION.

Dr. Peter H. Bryce, of Toronto.—The subject is one of such genuine interest to all of us, especially the executive health officers of either state or city, that I would consider it unfortunate to have the exceedingly valuable results of this paper go by without some discussion, or be lost in a bound book which is sometimes not read. Speaking as an executive officer of a city which has had control of the provincial supplies of water for a long time, the matter of the possibility of the introduction of mechanical filters has always been one of great interest, and one which to some extent is being introduced into our province. I have desired to know more about this matter of mechanical filters than it has been possible for me heretofore. It is now some four years since one of our cities placed one of these mechanical filters in position, and the prejudices were those advanced by Dr. Swarts. This year another city decided to put in mechanical filters, and the *pros* and *cons* of the subject were fully discussed, and we were anxious to determine, if possible, for ourselves what could be done with a view to making the water bacteriologically pure. I need not recount the details of it. We experimented with these filters and after three months were convinced of the possibility of making river water not only as clear as well water, but free from bacteria to the extent, on an average, of 90 per cent. The experiments detailed by Dr. Swarts were carried on in a much more extensive way than ours. We doubtless have in the mechanical filter a method of filtration free from the objections which in the older countries have attached to the use of sand filters or filtered beds on a broad scale. It seems, however, absolutely necessary to cover the filters in winter in order to get good results.

We owe our thanks to Dr. Swarts and the committee for the work they have done in giving us positive information in the figures presented. I shall study them with more care than we have had an opportunity to do in a short paper like this.

Dr. Charles V. Chapin, of Providence, R. I.—Our purpose in experimenting with these filters was to find some method to get rid of pathogenic bacteria. The removal of filth was not an element at all. It was to render the water wholesome that we conducted the experiments. We

became entirely satisfied that mechanical filtration, so-called, is more efficient, the filters are more easily managed, and less liable to be abused by the attendants. The cost of construction is much less than that of properly constructed so-called natural filters, and the cost of maintenance much less. The very interesting book by Mr. Hazen on "Water Filtration" has been published, and in it the estimates of cost of natural filtration are higher than those we made. He speaks decidedly in favor of covering natural filters, which we all know is an expensive matter, and particularly the necessity of covering them in the climate which we have in New England. The mechanical filters being small in area are cheaply covered. The superiority of the mechanical method of filtering water by the use of coagulants was first shown in the bacteriological results. They were somewhat better than the results obtained from the best natural sand filter. Still, I am not disposed to quarrel between the removal of 98 or 99 per cent. of bacteria, for if we can remove that proportion we can practically get rid of the danger. It makes very little difference, as far as danger is concerned, whether we remove 98 or 99 per cent. of bacteria from the water.

In regard to our experiments, one thing is to be considered, and it is this, that while our averages were about the same and a little higher as regards the removal of organisms than those obtained from the natural filters at Lawrence, the ratio of variation in different experiments on an average was much less than at Lawrence. Practically, if we are running a filter to remove bacteria from water we might have a good average, yet on certain days the percentage of removal was decreased to 60 or 70. On some days the percentage went to 10 per cent. In our experiments, as a rule, the percentage of bacteria was much less than in the experiments conducted at Lawrence, and this is by no means an unimportant matter.

Another thing, the use of coagulants in water removes the organic matter which is dissolved in it, as well as that which is suspended. I do not remember the exact figures because I have not looked at the report. We have found that water coming from natural sand filters will sustain bacterial life to a greater extent than that coming from mechanical filters. In mechanical filters the bacteria that remain die, showing that it is an exceedingly unfavorable medium for the growth of organisms of all kinds.

MR. RUDOLPH HERING, of New York city.—We are indebted to the city of Providence for conducting the experiments which have been described. We have lately, apparently, been led to believe that there was only one method by which water could be purified, namely, by natural filtration, as experimented upon and recommended by the State Board of Health of Massachusetts. It has seemed to many of us that mechanical filtration has certain merits. Up to this time there had not been made a proper series of experiments regarding the removal of bacteria from water, but now that has been done in a thorough manner, and I am glad to see that it has turned out very favorably. At the same time, there are two sides to the question. I would like to ask Dr. Swarts what the lowest

percentage of removal of the bacteria has been in these experiments. I think the doctor merely mentioned the best results, 97 per cent. What was the lowest percentage?

DR. SWARTS.—I think the lowest per cent. was 85.1.

MR. HERING.—Will Dr. Swarts kindly tell us why the New York filter was abandoned?

DR. SWARTS.—The New York filter ran about two weeks. In the first place, the amount of alum which came from it was in excess of what it should be. Careful attention was not given to the filter by the owners of it; the experiments were costly, and they did not think it was expedient to carry on any more experiments with the filter unless it was properly attended to, and the alum was properly introduced.

MR. HERING.—I take it, that its abandonment was mainly due to im proper attention. In the city of Atlanta where they use these filters, and had evidently done so for many years, they found at one time, when I was there, that the water was giving a great deal of trouble. Too much alum was introduced—I do not remember just exactly how much. It caused corrosion of many boilers, and if placed in iron pipes where there was a slight leak there was a large amount of oxide and sulphate of iron. This trouble continued until the quantity of alum was reduced. Therefore, care should be used in the quantity of that material because of its destructive effect to boilers. In New Orleans the same filters have been entirely unsuccessful because the Mississippi river water contains a great deal of silt. In this connection it is important to know the quality of water you propose to try to filter with mechanical filters. The water experimented with in Providence, I understand, is comparatively clear. Is that so?

DR. SWARTS.—Yes, that is right.

MR. HERING.—Regarding the stated expense of mechanical filtration, I would like to ask Dr. Chapin how that expense has been estimated. He states that it is less expensive than natural filtration. That should, of course, depend upon circumstances. I can readily see how it would be less expensive in certain parts of our country, as, for instance, in the south where we have mechanical filters, because the natural sand areas are scarce there—in fact, I do not know of any sufficiently extensive area in the large cities of the south where the water could be filtered according to the European or Massachusetts method. Were these estimates of cost based upon the experiments alone, or were they estimated on a proposition to erect a large plant, as, for instance, in Providence?

DR. CHAPIN.—The estimates were made by the assistant engineer of our city with very great care, and comprised the number of filters and their construction in the best possible manner, the style of the pipes, all enclosed in a brick building, provision for an electric light plant, the best possible workmanship, and a bacteriological laboratory.

DR. SWARTS.—I think the subject has been fully discussed, and I shall detain you but a minute or so. In regard to corrosion of the pipes in

the city of Atlanta, I think it will be found that the amount of alum used in this case ran up to about 6 per cent. I would like to ask Mr. Hering whether he knows.

MR. HERING.—I do not know the exact quantity, but the engineer added more than usual. He said the water was persistently turbid, he could not clear it with the ordinary means, and so he added a little more. It was after a heavy rain storm. The people of that city are accustomed to clear water, and yet he added a little more alum with disastrous results.

DR. SWARTS.—The point made by Mr. Hering that water in one locality is different from that in another on account of silt is well known; but we found this in our experiments, that when the water was turbid, or at its worst, filtration was easiest. I think all experiments will bear that out chemically. When water is tolerably clear, without anything to precipitate, it is more difficult to remove organisms by filtration.

CONTRIBUTION TO THE STUDY OF YELLOW FEVER IN CONNECTION WITH ITS MEDICAL GEOGRAPHY AND PROPHYLAXIS IN THE MEXICAN REPUBLIC.

By Dr. EDUARDO LICEAGA, of Mexico.

Gentlemen—For the third time I come to take up the attention of this Association with a study on the subject of yellow fever in the Mexican Republic, and with the object of corresponding to the initiative presented to Dr. F. Formento, at the time when Mexico was fortunate enough to receive the visit of the American Public Health Association. For the third time I quote the words which Dr. Formento employed in inviting me to comply with the commission with which I was charged, as a member of the international committee on the study of yellow fever, and which were as follows:

"We hope to be able to present at the next meeting a partial report, at least, on this important international sanitary question and in order to facilitate the work of the committee, each individual member of the same is urgently requested to give full expression of his views on the subject, and indicate such sanitary measures and local reforms or improvements, in the reputed habitants of yellow fever, as he considers most effective to bring about the greatly desired object, namely: the stamping out of the scourge in its very cradle."

These words will convince you that I am under the obligation of expressing my manner of considering this question; the sanitary measures which ought to be adopted in order to prevent the propagation of the disease, and the way in which it can be stamped out in those places where it has its origin.

In my two previous papers I have shown:

1. That along the whole length of the extensive coast of the Mexican Republic on the Pacific ocean, there is not a single point where yellow fever is endemic.

2. That on the coast of the Mexican Republic on the Gulf of Mexico, from Matamoras and as far as Belize doubling Cape Catoche, there are only two points where yellow fever is endemic, and which are the Port of Vera Cruz and the district situated in the extreme northern part of the Peninsula of Yucatan.

3. In a diagram which accompanied my second paper, I showed that in the most important source of yellow fever on the Mexican coast, Vera Cruz, the mortality recorded during twenty-four years was very low; that

the epidemic did not appear every year, and that when it did appear it was not very severe, except in the years 1881 and 1883.

I now present the statistics of yellow fever during the present year.

It is well known that the yellow fever has taken a most alarming development this year, in all those districts where it has assumed an endemic form; the island of Cuba, the Central American Republics, the Republics of Brazil and of South America in general, have either passed or are at present passing through epidemics of an alarming character; but nevertheless, the disease in the Mexican Republic has gone beyond its endemic sources, which are Vera Cruz and the districts situated in the northern part of the Peninsula of Yucatan. A sick woman arrived in Frontera and died there, but she was carefully isolated, the place where she lived was disinfected, and the disease was not propagated.

In spite of the frequent communications with Havana and the still more frequent one with Vera Cruz, no case of yellow fever has been discovered outside of Vera Cruz, which is the principal *source* of the disease.

The epidemic commenced in that port in the month of January with nine cases. It reached its maximum in the month of July with 125 cases. The decline of the epidemic began to show itself in the middle of August and coincided with the appearance of gales. All these data will be taken in at a glance over a table which I accompany. They are derived from official sources and have been furnished by Dr. M. Iglesias, delegate of the Supreme Board of Health, in the Port of Vera Cruz.

Those which I now present relating to the northern districts of the Peninsula of Yucatan, second source of yellow fever in the Mexican Republic, have been furnished to me by Dr. Pelomeque, a most distinguished physician of Merida and general secretary to the government of the state of Yucatan, who in his double character possesses the exact data with which he has supplied me and which I am sorry I cannot transcribe in all its details. He relates the history of a sole case which has been presented in the hospital in Merida, and which is that of a person who on arrival from the capital of the Republic contracted the disease on the 3d of June of this year and was eventually cured. To the same disease we may refer the cases of two youths, twelve and fifteen years of age, who were attended by the doctor, and whom he described as suffering from *acclimation fever*, the two of them having arrived from the capital of the Republic. I have already tried to show in my first paper, that these cases ought to be considered as attenuated forms of yellow fever, but at the same time producing immunity.

From these data and from those which were furnished by the delegate of the board of health, in Progreso, we find that in the Peninsula of Yucatan, in the course of the present year, there are only *three cases* of yellow fever, none of which had a fatal termination.

This is what takes place in the sources of the disease. With respect to other towns, the official data show that yellow fever has not been propagated, and therefore throughout the whole coast of the republic which is

bathed by the waters of the Gulf of Mexico, the yellow fever has not existed during the present year, except in the port of Vera Cruz, where we had a mortality of 120.

According to the official data, there is no point on the Pacific coast where the disease is endemic, and we only know of one passenger who landed in the Port of Acapulco on the 3d of September of this year, from the steamer *City of Sydney* from Panama, and who was attacked by yellow fever on the fifth day after landing, and died after a sickness of seven days. The body was buried on the island of Roqueta; every article which he could have contaminated was carefully disinfected; all the provisions referring to this question in the Maritime Sanitary Regulations were complied with, taking the steps that are there ordered with respect to shipping in such cases, and the disease did not spread any further.

The measures which have been taken to prevent a spread of the disease, are all in accordance with law and are set forth in the sanitary Code which was reformed in 1894 and in the Maritime Sanitary Regulations, which documents will be found accompanying this paper. The organization of the sanitary authorities in the ports, has the preferent attention of the Board of Health, from whom they depend; and the disinfecting service is in full operation in every place where it is required, so that owing to these measures of defense, the yellow fever has not been able to invade any port on the Gulf, in spite of the very frequent communication which they all have with Vera Cruz, and also in spite of the facilities for communication with the island of Cuba, where the epidemic has assumed very large proportions on account of the large bodies of troops that Spain has sent to that island in order to suppress the war that is now devastating that important colony. In spite, I repeat, of the frequency and facility of these communications, the epidemic of yellow fever has not been propagated on the gulf coast of the Mexican Republic, thus showing, in my opinion, that the sanitary measures have corresponded to the hopes with which they were established.

In order to stamp out the disease in its very cradle, which is Vera Cruz, it is proposed to carry out the sanitation of the city by means of a project which is now being considered by the Municipal Council of that port. The bases of this project are: an abundant supply of drinking water; the suppression of closets with cesspools; the construction of a complete and perfect system of sewers, which will carry the refuse of the town outside of the port and to a place where they will inflict no injury on either the residents or the ships that are anchored in the bay.

The experience of all nations, but more especially that which has been obtained in English cities, very clearly shows that the development of epidemics can be prevented in those cities where the sanitation is perfect, and this is what it is proposed to do in Vera Cruz. This most efficacious, as well as preventative, measure, will prevent the spontaneous birth of yellow fever in the locality, and sooner or later will stamp out

the *source* of the disease, as has been done in New Orleans, where it may be said that hygienic measures have driven out the yellow fever.

The other measure to be adopted for the stamping out of an epidemic which already exists, is found in the cure of the cases which have already presented themselves. With a view to the realization of this idea, we have the proposition presented to the physicians of Vera Cruz, that they should study the methods for applying the blood serum of persons who have already acquired immunity through a previous attack of yellow fever, and effect the cure of fresh cases by inoculation of this serum.

This process, which is the idea of the distinguished bacteriologist and member of our Association, Dr. Sternberg, and was presented to this same Association in the year 1892, has received a brilliant confirmation through the applications that, in accordance with the Behring method, have been applied to the cure of diphtheria, and there is no doubt that it will result as efficaciously with yellow fever as it already has with the other scourge of humanity.

In conclusion, we reach the following facts :

1. The "vómito," or yellow fever, does not exist in an endemic condition except in the port of Vera Cruz and in the northern districts of the Peninsula of Yucatan, as far as regards the Gulf of Mexico.

2. There is not a single endemic *source* of this disease, on the Pacific coast of the Mexican Republic.

3. There has been no epidemic during the present year except in the port of Vera Cruz, with a mortality of 120 in the eight months from January to August.

4. The only other place where the disease is endemic in the northern part of Yucatan is Merida, where only three cases have presented themselves.

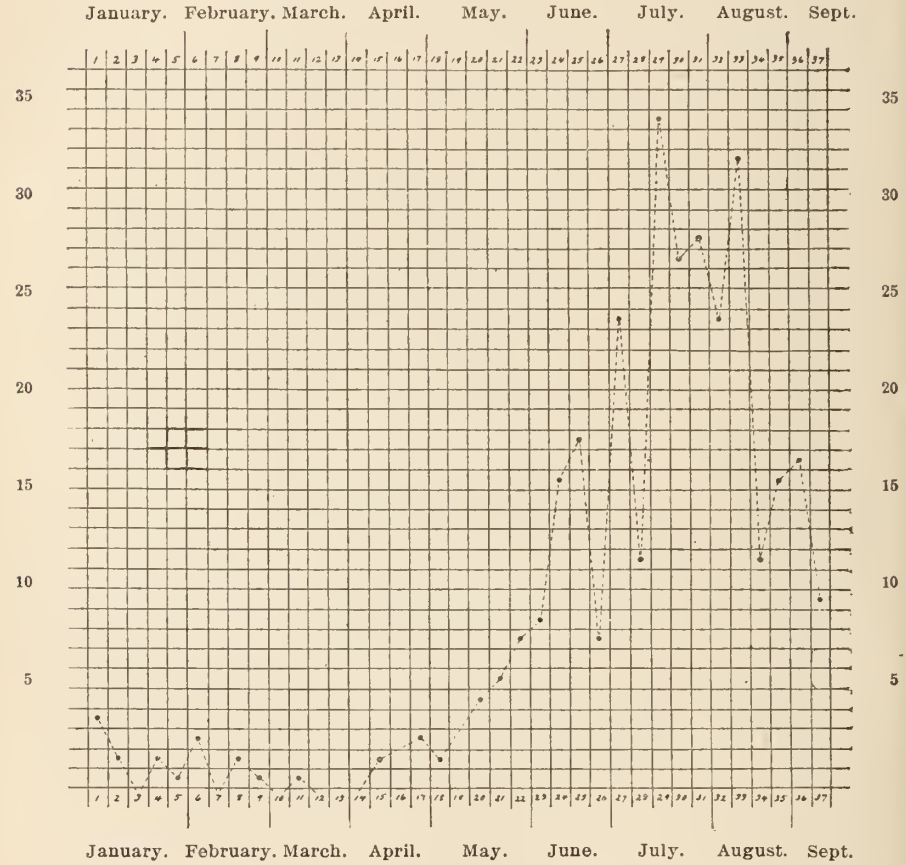
5. The epidemic has not extended itself beyond the places of its present origin during the present year, and it has not invaded any other point in the Mexican Republic due to the efficacious and strict application of the sanitary laws at present in force.

Mexico 24th of September, 1895.

Mortality in the port of Vera Cruz in the eight months from January to August of the year of 1895.

January	6
February	1
March	1
April	2
May	12
June	23
July	40
August	35
	120

NUMBER OF CASES OF YELLOW FEVER OBSERVED AT THE PORT OF VERA CRUZ IN THE THIRTY-SEVEN WEEKS FROM THE 1ST OF JANUARY TO THE 15TH OF SEPTEMBER, 1895.



PROPHYLAXIS OF YELLOW FEVER.

By DR. MANUEL CARMONA Y VALLE of Mexico.

The labors of the Klemperer Brothers on pneumonia; those of Behrings and Roux on diphtheria, and the more recent studies of Marmorek on the estreptococcus, have shown us the utility of sero-therapia, both for the treatment of the diseases I have mentioned as well as for the object of obtaining the immunity of healthy individuals. But what renders these therapeutic measures really practical, is the fact that by means of virulent culture of the respective micro-organisms, we have been able to obtain that immunity of animals of large size, from which we can afterwards obtain an abundant supply of serum for therapeutic purposes.

The advantages of this system cannot, up to the present date, be made available against yellow fever, and for the following reasons: 1. As we do not as yet know the microbe which generates the disease, it is not possible to obtain the virulent culture which forms the basis of the process; and, 2, up to this date, we do not know, with any certainty, which are the animals of large size which are susceptible to the germ of *typhus ictheroides*.

It is true that we might employ the serum obtained from the blood of persons who are sick or convalescent from yellow fever; but there is no necessity for entering into the reasons against the general use of such a process, seeing that it would not be entirely innocent or practicable to freely bleed persons under these conditions.

We may therefore rest assured, that, however great may be the results that up to this date have been reached by science, in the treatment and prophylaxis of certain diseases by the use of sero-therapia, we have not yet discovered any easy way of taking advantage of this therapeutic and prophylactic process with respect to yellow fever.

The sub-cutaneous injections of urine which, guided by other motives, I frequently practised as a prophylactic measure against that disease, from the year 1882 up to 1886, perhaps may be one means of obtaining the sero-therapia; because, in fact, the urine is formed by the serum of the blood with the albumen eliminated, and which in passing through the renal filter, becomes charged with urea and other excrementicious principles. Now the anti-toxine substances, or those which impart its bactericidal power to blood serum, must be found in this liquid in a state of solution, and consequently, must have been passed so as to be found in the urine. The amount of urea and excrementicious matter which is contained in the three or four cubic centimetres of urine, cannot be injurious to the system, as is proved by the many injections which I have practised. The result is, that on making an injection of urine, we introduce into the

system a certain quantity of liquid that, like serum, contains the antitoxine or bactericidal principle which is contained in the serum and besides that, a small amount of urea and other similar substances which do not prejudice the animal system.

On the other hand, whilst I was making these inoculations in Mexico, Mr. Bouchard was demonstrating in Paris, that when animals are submitted to the action of certain pathogenic germs, their urine contain the vaccinating principle against the effects produced by those same germs; and that by the injection of the urine of diseased animals into healthy animals, the latter obtained an immunity against the effects of those pathogenic germs.

In one of the general sessions of the International Medical Congress which met in Berlin in the year 1890 M. Bouchard read a work which was very much praised and to which he gave the title of "Essai d'une Theorie de l' Infection." In treating of the theory which supposes that the vaccinating principle prevented the life of the microbes which have created them, he expresses himself as follows: "J e pense avoir rendu peu vraisemblable cette opinion quan d j'ai etabli que les matieres vaccinantes s'eliminent par les urines. Charrin et A. Ruffer ont fait voir qu'il faut quatorze jours pour que leur elimination soit complete, mais apres ce temps, l'etat d'inmunite ne persiste pas moins." It is therefore evident that I do not stand alone in this scientific question, in publishing as I did in the year 1885, that the sub-cutaneous injection of the urine from a person suffering from yellow fever, could vaccinate a sound person. The same ideas have been expressed by M. Bouchard, who is recognized as a very competent authority, and Doctor Sternberg himself has gone so far as to say, that in view of the results I may possibly be right, and has proposed that the residuum of urine that I employ, should be obtained by the evaporation of that liquid in a vacuum.

My preventive inoculations have been very successfully employed in Panama, and Dr. Garcia del Tornel asserts that he has extensively used them on the coast of Vera Cruz, and that they have only failed in very exceptional cases. Nevertheless, there are not wanting physicians who bitterly censure this treatment, without having made any trial of it, and only because a few of the persons whom I have inoculated have been attacked by the disease and succumbed. But I may be permitted to ask, if there is any method of inoculation or vaccination, which infallibly acts on all the subjects operated, during a period of epidemic. On the other hand, the method of procedure may as yet have some defects; perhaps it may be necessary to increase the dose of the injection; perhaps to repeat it two or three or more times, or to introduce other modifications, which can only be discovered by those physicians who, practising in localities which are infected, have facilities for observation; but it is by no means advisable to throw out this method *a priori* on account of the mere fact that a few of the subjects I have inoculated, fell victims to the attacks of yellow fever.

I will now relate in a general way the results of my inoculations as practised from the year 1882 to 1885. I would remark, that as I have not practised in the infected localities, I could not make use of fresh urine, but had to evaporate it at a normal temperature and at the moment of practising an inoculation, I dissolved five centigrammes of the residuum in one gramme of pure water, and by means of a Pravaz syringe, I made a sub-cutaneous injection in the cellular tissue of the back of the arm. In this manner I made 1,358 inoculations, without any other consequence following than the formation of a single abscess in the place where the injection had been made.

From 1882 to 1883, I inoculated 208 persons who were proceeding to different places at that time infected: Vera Cruz, Havana, Mazatlan, Colima, Lower California, etc., and the only ones of these persons who were attacked by the disease, were two persons who went to Mazatlan; one being an engineer who had slight symptoms and the other a relative of mine, who was employed in the custom house, and who did not keep to his bed or discontinue his work in spite of his showing the yellow color which is characteristic of the disease. Some of these persons are still residing in Havana, and although a period of thirteen years has elapsed, they have not suffered from anything that resembles yellow fever.

More than 100 persons who went to the exposition of New Orleans, were inoculated in the same manner and none of them took the disease, although it must be confessed that the epidemic was of a mild character in that locality. In 1884, I inoculated 38 persons who belonged to a comic opera company, and who were proceeding to Vera Cruz and Havana in order to give representations. They themselves confessed that they took no care of themselves and that they did not lead a very orderly life, but nevertheless, none of them were attacked with yellow fever. Many of these persons are still acting in Mexico; they have on several occasions returned to the infested localities, but they have never suffered from the slightest symptoms that could be attributed to yellow fever.

In the same year of 1884, ten persons went to settle in Mazatlan, of whom four had themselves inoculated whilst the other six did not take that precaution. Of the four persons inoculated, not a single one was attacked by the disease; whilst the other six were attacked one after the other and all succumbed to the disease.

However eloquent these facts may be, they are nevertheless isolated cases, and may be attributed to chance, because not all the persons who emigrate to an infested locality necessarily take the disease and my inoculated subjects may have belonged to that class of persons. It was necessary for me to make a comparative study, between persons who would be equally predisposed, and from amongst whom one group would be inoculated and the other not.

This desideratum was obtained in the year 1885. There were 380 soldiers in the garrison of Vera Cruz, who not being natives of that coast, had a natural predisposition to contract the disease, and these men were

inoculated in the month of May, when the epidemic had already commenced. Amongst the convicts, there were 176 persons who for similar reasons were also predisposed to contract the yellow fever, and this group was not inoculated, in order to make a comparison with the soldiers. The epidemic was very violent that year, and reached its maximum in the months of July and August. The two groups were carefully observed from the end of May to the end of October, with the following results: amongst the convicts who were not inoculated, 42 per cent. were attacked; whilst amongst the soldiers who had been inoculated, only 7 per cent. were attacked.

At the end of July, 174 soldiers who had not been inoculated arrived from Tabasco, a city on our coast. In this new group, 32 per cent. of its individuals were attacked, during the months of August, September, and October; whilst during the same time, the inoculated group only contributed 3 per cent. to the list of yellow-fever patients. In view of the above, the advantages of inoculation can no longer be doubted.

In the month of July of that same year, 76 soldiers who were departing for Acayucan were inoculated, and the detachment was increased by one individual more who was not inoculated. These soldiers went down to Vera Cruz, where they remained for six days and afterwards proceeded to Acayucan. Those who had been inoculated, had no trouble whatever, whilst the one soldier who had not been inoculated, reached Acayucan with the yellow fever and died a few days after.

Having now related the result of my experiments, I must add, that under the present conditions of science, the method of procedure ought to be modified. The physicians who are practising in the infested localities, do not require to evaporate the urine. They ought to select individuals who have a perfectly healthy urethra; who have reached at least the fourth day of the disease, without passing the 14th; because according to M. Bouchard, the vaccinating principle does not acquire its full development before the fourth day; but requires 14 days for its elimination. A catheter and perfectly sterilized vessels ought to be employed, and with a syringe of the proper class and also carefully sterilized, a sub-cutaneous injection should be made on each individual, of two to four cubic centimetres of urine.

The method of operation could afterwards be perfected, so as to give a greater guarantee to the inoculated persons; as after careful study and after finding that there is no alteration in the results of the inoculation, by filtering the urine in Pasteur filters, that method of operation might be employed before making the inoculations, thus obtaining a guarantee that only liquids in a perfectly aseptic condition should be employed.

It might also be advisable to undertake the work of separating the vaccinating matters from the urine. M. Bouchard says that these matters can be isolated by means of absolute alcohol, and that he proceeds in the following manner: He evaporates the urine in a vacuum, at a temperature of 35°, until he reduces it to the fifth or sixth part of its original

volume. He then treats it with a volume six times greater of absolute alcohol, producing an abundant precipitate. This precipitate is collected in a filter and carefully washed with alcohol at 80°. The precipitate is then re-dissolved in water and is precipitated afresh with four times its volume of absolute alcohol. It is then washed afresh with alcohol at 80° and afterwards dissolved in the quantity which is absolutely necessary of water saturated with naphthols; and with this solution others are prepared with 5, 4, 3, 2, and 1 per cent. After a few experiments, it will be easy to determine the degree of concentration and the quantity which would be necessary to obtain the desired immunity.

It ought never to be forgotten, that, however efficacious a vaccination may be, it has not been possible, up to this date, to prevent the disease attacking some of the inoculated persons. The Jenner system of vaccinating, the oldest and best studied that we know of, does not escape this law. According to Grancher, 2, 3 per cent. of the vaccinated persons die of small pox, and if this rate of mortality is reached, double that proportion must be attacked at the very least; that is to say, that not less than 5 per cent. of the vaccinated persons must be attacked, and this proportion is approximately the same as that which resulted in Vera Cruz with yellow fever. The frequent discussions which have taken place in scientific academies, with respect to the degeneration of human vaccine, as well as those which have arisen with respect to re-vaccination, lead us to see the comparative frequency with which vaccinated individuals are attacked with small pox; especially in periods of epidemic. We should not be more exacting with the inoculations here treated of, than we are with cow-pox.

In conclusion I would say, that my original method of inoculation ought to be practised by those physicians we do not reside in the localities where yellow fever is found. In the latter cases, the urine ought to be collected with all the precautions required by antiseptics; they ought to be evaporated until they are dry in a vacuum, and the residuum ought to be carefully kept in small flasks, which would be perfectly aseptic and hermetically sealed.

Whenever we discover a method of separating the vaccinating matter from the urine, this would be the only preparation that ought to be employed.

MEANS OF CORRECTING THE ABUSE OF ALCOHOLIC DRINKS.[1]

By SALVADOR GARCIADIEGO, M. D.,

Director of Academic Saint Miguel Hospital and of the Medicine College of Guadalajara, Jalisco (Republica Mexicana).

The enormous extension of the vice of drunkenness in these latter years justly claims the special attention of hygienists.

In 1893 I presented to the section of hygiene of the Pan-American Medical Congress some considerations on this subject, but they have not been printed yet, and I desire to present them again, because this subject is occupying the attention of European writers.

Demography is justly pre-occupied with this abuse, and it studies the proper means to prevent its increase; but it has not been efficacious in its efforts up to the present. If a certain temperance in drinking has been obtained, it has affected a small number of persons and unfortunately but for a brief time. "Man who drinks always drinks" is a proverb; and in spite of the sound and wise part of society and its constant efforts to combat drunkenness, it has at last to confess itself impotent and still to lament the horrible ravages that this deplorable vice brings upon those given to the habit, and the dangerous consequences to their families and to the society to which they belong.

To present to a congress of hygienists a history of alcohol and to speak about its primitive effects in order to consider afterwards its remote effects, would be a repetition of what everybody knows. I shall, therefore, only offer a few etiological considerations and make a few observations on the pathogeny of this awful vice.

I regret to express it, but I am obliged to confess that modern therapeutics has contributed largely to the development of this vice. Since Broussai's antiphlogistic method and Razzori's counter-stimulus have been abandoned, it has been proposed as a special aim in the treatment of pyrexes and phlegmasies to obtain at all hazards hypothermy and constant stimulation either of the heart or the brain. The use of alcohol in large doses either in the form of natural wines or pharmacological preparations is common. Though the disease is over, unfortunately the patient often longs for the transient effect afforded by the alcoholic stimulant and very often resorts to it under the pretext of combating the weakness of convalescence or the exhaustion produced by excessive labor, wakefulness, or extreme climates. He has become accustomed to the taste of alcohol and whenever he feels a deficiency in his functions has recourse

[1] Presented to the American Public Health Association Meeting assembled at Denver, Col., October 1, 1895.

to it as a relief. He begins in order to stimulate his nervous system, and falls into constant collapses. Other individuals begin to use alcohol as a hypnotic and drink large quantities of it on going to bed, when they are submerged in a profound collapse better than sleep and after a short while gastro-intestinal and cerebral disorders appear, characterizing intemperance.

The frequent epidemics of "grippe" in these late years and the fatality of the warm preconizing of brandy among other alcoholic drinks for combating the phenomena of depression of the heart and vessels, the almost exclusive use of Todd's potion for curing pneumonias, whatever their form might be, the use of alcoholic aperients of all kinds, the custom of attributing most part of dyspeptic symptoms to gastro-intestinal astheny and prescribing the use of elixirs, wines, tinctures, serving of vehicles, as strychnine, coca, etc., are other of the many therapeutic circumstances of the increasing of drunkenness.

Besides, the whirlwind that drags us along, in this century of positivism, to the material well-being and luxury and ostentation obliges us to live among a moral, unbearable tension, and that exhausting our mental, moral, and physical strengths by anxiety and sorrow, bringing with them arduous and daring enterprises and their consequent deceptions, we are compelled to look for a lenitive that softens our disquietness, and we recur to alcohol, tobacco, opium, to morphium, to the use of ethers, chloroform, etc., according to nationality, habits, pecuniary proportions, social position, and lastly, until the fashion takes a part in this lethal election of means, being for our frail organisms too stimulated, besides true and sure poisons.

In drunkards, alcohol is absorbed *in natura* and in a great quantity by the porta-vein system and carried *incontinenti* into liver's parenchyma from where it suddenly passes to the heart, macerating the endocardium and endotheliums, being then transported to the brain, bearing also a maceration at the repeated contract of it. Perturbations comported by the liver are of three kinds: incomplete coagulation and contraction of the protheic magna that softens its lobes and is a mixture of the fluid dragged along by porta-vein of the blood that has served for the nutrition of the dejectory tube and anexe glands, spleen pancreas, and of the product of disjunction of hematies, not then that this phenomenon of nutrition be verified in the liver or in the spleen; to these substances intestinal toxines and poisons of the same origin, coming to be fixed in the cells must be added, the same as impure sulphurous gases, product of intestinal pneumatose. In the middle of this magna, hepatic cells must elaborate the sugar and make the secretion of urobiline a not ferruginois derivate of hemoglobin that will serve for the elaboration of biliary pigments or to be eliminated by the kidneys as pathological production.

All these phenomena of interne and interstitial nutrition are overthrown by the presence of alcohol in the hepatic magna.

Moreover, the biliary secretion belonging to the bile tubes is disturbed because alcohol prevents the mechanism of the necessary developments for the formation of those. Lastly the sheaths of Glisson's capsule wrapping the hepatic tubes and vessels, are bathed by alcohol, they retract themselves, are macerated, and this constant stimulus produces a larger proliferation of embryoriary elements and scirrhose appears.

Lesions determined by alcohol in vascular and nervous systems are different, according as the quantities of this substance be absorbed little by little, and almost continually, or they suddenly arrive to the circulatory torrent.

I do not enter into more details, they would be prolix. Let it be enough, after these few slight considerations about pathology and pathogeny of alcoholism, to propose to this honorable and respectable congress the means that in my judgment would be able to contribute, if not at present, in the future, to lessen the abuse of alcoholic drinks:

1. To name a commission formed by members of this congress to form a pathetic description of acute and chronic alcoholism effects.

2. When approved by the committee named in the next congress, to obtain from the respective governments of Mexico, United States, and Canada, it be printed and adopted as a text-book of reading at elementary colleges in the way of touching vividly boys' impressible minds, so that they may keep this impression always and that it may preserve them from the vice of drunkenness, known as it is that the lasting impressions of childhood prevail in the acts of the whole life.

3. To beg of the same governments the imposing of high taxes to the elaboration, expending, and importation of alcoholic drinks.

4. To beg them equally the founding of special hospitals for alcoholics, and to grant diplomas, pecuniary prices, employments to those who mend themselves, forsaking drunkenness to try the teaching of them in their religious and social duties and that young men and boys who follow one and two by elementary instruction, visit them from time to time in order to make useful readings and know positive and practically alcoholism effects and feel against them the greatest reluctance as a degrading vice.

5. To work for making effective the punishments marked by codes to drunkenness in criminals, and not be only consigned as an aggravating circumstance.

6. To let boys and young men the free use of good wines at the hours accustomed in their homes, in the connection where its use is common and necessary.

REPORT OF THE COMMITTEE ON THE DISPOSAL OF THE DEAD.

C. O. PROBST, M. D., CHAIRMAN.

MR. PRESIDENT: The proper disposal of the dead is a matter which greatly concerns the living. The dead have been disposed of in various ways in different times and places; no useful purpose will be served by going into the history of the subject, and this report will be confined to the consideration of cremation and earth burial. The history and progress of cremation in the United States (there are no crematories in Canada) will be reported upon briefly, and an attempt has been made to summarize the laws of the various states and provinces with respect to disposal of the dead, more especially as to sanitary considerations taken note of in such laws. Rules and regulations of State and Provincial Boards of Health, as affecting this question, have also been given as far as possible.

The first crematory in the United States was established at Washington, Pennsylvania, in 1876, by Dr. F. J. LeMoyne. It was used for the first time on December 6th of that year, when the body of Baron de Palm was cremated. Dr. LeMoyne's crematory excited great local opposition, and this local feeling, apparently, was never overcome, for the only resident of Washington to be cremated in this furnace was Dr. LeMoyne himself. In 1884 this crematory was practically closed, by the decision of the trustees to limit its use to those living in Washington county; and there have been no applications and no cremations there since. Thirty-eight bodies were cremated, 29 males and 9 females.

The second crematory was also in Pennsylvania, at Lancaster, and was opened November 25, 1884. Three bodies were cremated in that year, 36 the following year, but not more than 14 in any year thereafter. The secretary of the company, Mr. J. D. Pyatt, writes "We do little work here now; we got in our work as pioneers, and have spent six or seven thousand dollars doing it, with no dividends." Eighty-nine bodies have been cremated, only nine being bodies of residents. Sixty-seven were males and twenty-two females. Death was due to a contagious disease in 13 cases.

The following year, 1885, the most successful of all the crematories in the United States was opened at Fresh Pond, Long Island, N. Y. Five bodies were cremated in that year, 82 the next, and in 1894 there were 254. To August 28th of this year there were 208 cremations, making a total of 1,554. Of these 1,084 were males and 470 females. Including phthisis pulmonalis, 280 died of a contagious disease.

It is interesting to note that 806 of those whose bodies were incinerat

ed were born in Germany, 513 in the United States, and the rest in the various countries of the world.

In 1886 Pennsylvania established her third crematory, and New York her second. The one in Pennsylvania was constructed at Pittsburgh by Mr. Sampson, an undertaker. The number cremated to the end of 1894, the latest data available, was 100, 63 males, 37 females.

The second New York crematory is at Buffalo, and was opened with a test incineration December 27, 1885. Eight were cremated in 1886, 37 in 1891, the greatest number in any year since, and 29 to September 5th of the present year. The total number is 250—166 males and 84 females. One hundred and forty-eight were residents and 102 non-residents.

In 1887 three crematories were added to the list, one at Cincinnati, one at Los Angeles, and one at Detroit. The Cincinnati crematory was opened June 22, 1887, and 11 were cremated that year. The number increased to 46 in 1894, and for 1895, to August 16th there were 44, making in all 314. Two hundred and fourteen of these were males, 100 females, and 38 were children under fifteen years of age. Two hundred and forty were residents, 74 non-residents, and 62 died of some contagious disease. The Detroit crematory was opened December 10, 1887. The greatest number cremated in any one year since was 45 in 1893. The total number to April 20, 1895, was 183. Of these 125 were residents and 58 non-residents. One hundred and eleven were males and 72 females; 24, counting phthisis pulmonalis, died of some contagious disease. Only partial statistics were obtained from Los Angeles. The crematory was opened June 6, 1887. Seven bodies were cremated that year. The greatest number in any one year since was 41 in 1892. The total number to the end of 1894 was 182—119 males and 63 females.

It is an interesting fact that the name of the president of the Cremation Society of Southern California, having its crematory at Los Angeles, is Dr. Wm. *LeMoyne* Wills.

St. Louis and Philadelphia established crematories in 1888.

According to the retort of the Bostonian it is peculiarly fitting that Philadelphia should be well provided for the disposal of the dead. The Bostonian was showing a Philadelphia friend over Boston. The Philadelphian remarked, "You have a great city here but you are not nearly so well laid out as Philadelphia." "True," retorted the Bostonian, "but we doubtless will be when we are dead as Philadelphia."

The Philadelphia crematory was opened in May, 1888. There has been a gradual increase in cremations, with 70 in 1894, and 75 for 1895 to August 14th. The total number is 399, of which 264 were males and 135 females. Three hundred were residents and 99 non-residents. Twenty-six of those cremated died of a contagious disease.

The St. Louis crematory was opened in 1888, since which time to September 18, 1895, 437 bodies have been cremated. The number has gradually increased from year to year, with 70 for 1894. Three hundred nd forty of those cremated were residents, 97 non-residents. Three

hundred were males and 137 females. None died of a contagious disease.

Baltimore established a crematory in October of 1889. Up to May 14th of this year only 84 bodies had been cremated, fifty-seven males and 27 females. None died of a contagious disease.

In the same year a crematory was constructed on Swinburn Island for the destruction of the bodies of those dying of a contagious disease in quarantine or on vessels at New York. To the end of 1894, the latest information at hand, 109 bodies had been incinerated.

In 1890 a crematory was built at Troy, N. Y., by Mr. and Mrs. Earl for their only son, Gardner. To the end of 1894, 56 bodies had been cremated, 37 males and 19 females.

The following year, in March, Davenport, Iowa, erected a crematory. Thirty-six cremations have occurred there to April 20, 1895. Of these 27 were of males, 9 of females.

The same year, 1891, Mr. Wm. Osborn of Waterville, N. Y., erected and donated a crematorium to the Waterville Cemetery Association. Only five bodies have been cremated there to August 16, 1895, four males and one female, one being the body of a resident.

The year 1893 witnessed the building of crematories in three important cities—Chicago, San Francisco, and Boston.

The Chicago crematorium was opened in December, since which time to August 27, 1895, 87 bodies have been incinerated. Of these 54 were males, 33 females; 60 were residents and 27 non-residents. One person died of a contagious disease.

The San Francisco crematory was opened November 12, 1893. On May 1, 1895, 200 bodies had been incinerated—112 males and 88 females. One hundred and thirty of these were American born. Three died of a contagious disease.

Boston inaugurated cremation on next to the closing day of 1893, the person cremated being a resident of Massachusetts. In 1894, 97 persons were cremated, 78 of them being residents of the state. In 1895, to April 22, there were 30, with 22 of them residents. In all there have been 118, a very good beginning. Here, as was to have been expected, woman has had equal rights (not rites) and 59 males and 59 females embraced the new faith of cremation. Four of the subjects died of diphtheria, three of influenza, and one of typhoid fever.

The last crematory to be constructed was at the Odd Fellow's Cemetery at San Francisco. The first incineration took place June 25, 1895. Up to August 22d 28 bodies had been cremated, 18 males and 10 females. None died of a contagious disease.

The total number of persons cremated in the United States at the close of this inquiry was 4,261. Omitting Swinburn Island, from which information as to sex was not obtained, there were 2,783 males and 1,369 females.

The main reason for the great preponderance of males doubtless is the number of cremation societies that have been established, composed largely of males, whose members make provision for the cremation of their bodies at death.

Omitting Pittsburgh and Buffalo, from which information could not be obtained, 526 of those who were cremated died of some contagious disease; about 13 per cent.

Nearly all of these crematories are managed and operated by joint stock companies. The usual price for cremation is $25.00. The highest charge is at San Francisco, which is $60.00.

Massachusetts, Michigan, Pennsylvania, California, and Ohio are the only states, so far as found, whose laws recognize cremation in any way, and Massachusetts seems to be the only one in which cremation is fully regulated and controlled.

The only objection urged against cremation, aside from sentimental reasons, is that cremation destroys evidence of crime.

Cremationists claim that the extra precautions taken to verify the cause of death give, in reality, greater security against this than does earth burial, as ordinarily practised. The usual precaution in this country is to require the affidavit of a physician, not necessarily in all cases the attending physician, that to the best of his knowledge and belief there exists no reason why the deceased person should not be cremated. This is sworn to before a notary, or justice of the peace, who certifies that the affiant is by him known to be a physician of good standing. Several crematories accept bodies for cremation when accompanied only by the ordinary board of health permit, this permit being issued, however, only on presentation of a certificate from the attending physician as to the cause of death.

It will readily be seen by those familiar with the usual methods of issuing certificates, that the opportunity this offers for concealment of crime is very great. Even an affidavit by the attending physician, with certificate of the notary as to his standing, when the body is brought from abroad, affords no adequate barrier against this danger.

In Massachusetts the location and construction of crematories must first be approved by the state board of health. The board also establishes the regulations which shall govern their use; and the body of a deceased person may not be cremated until 48 hours after death, unless due to a contagious disease. In addition to the customary burial permit, which is issued only on certificate of the attending physician as to cause of death, there must be a certificate from the medical examiner of the district within which the death occurs. This applies to the states of Massachusetts, Connecticut, and Rhode Island. Dead bodies from other states must be accompanied by the sworn statement of two physicians, each of whom must be a graduate of some "legally organized medical college," and one of whom shall have been the attending physician. Even this would not give very great protection in the case of dead bodies sent from

Ohio, and some other states, where "legally organized medical colleges" are graduating some very disreputable persons.

TABLE SHOWING LOCATION, DATE OF OPENING, ETC., OF CREMATORIES IN THE UNITED STATES.

LOCATION.	Date.	No. cremated.	Residents.	Non-residents.	Male.	Female.	No. died contagious disease.	Charges, dollars.
Washington, Pa.	1876	38	1	37	29	9	None.	
Lancaster, Pa.	1884	89	9	80	67	22	13	$50
Fresh Pond, L. Is., N. Y.	1885	1,554	.....	.....	1,084	470	280	25 to 50
Buffalo, N. Y.	1885	250	148	102	166	84	.....	25
Pittsburgh, Pa.	1886	100	.....	.....	63	37	.....	
Cincinnati, O.	1887	314	240	74	214	100	62	25
Detroit, Mich.	1887	183	125	58	111	72	24	25
Los Angeles, Cal.	1887	182	.....	.....	119	63	.....	
St. Louis, Mo.	1888	437	340	97	300	137	None.	25
Philadelphia, Pa.	1888	399	300	99	264	135	26	35
Baltimore, Md.	1889	84	.....	.....	57	27	None.	40
Swinburn Is., N. Y.	1889	109	.....	.....	.....	.....	109	
Troy, N. Y.	1890	56	.....	.....	37	19	None.	
Waterville, N. Y.	1891	5	1	4	1	4	None.	25
Davenport, Iowa.	1891	36	.....	.....	27	9	None.	
San Francisco, Cal.	1893	200	.....	.....	112	88	3	60
Chicago, Ill.	1893	87	60	27	54	33	1	25
Boston, Mass.	1893	118	100	18	59	59	8	30
San Francisco, Cal.	1895	28	.....	.....	18	10	None.	

We may now turn our attention to earth burial, with special reference to the laws and regulations governing it in the United States and Canada.

The opinion is quite generally held by all classes of people, that cemeteries and earth burial, unless properly controlled, may become a menace to the public health, and one is surprised to find that so little consideration has been given to the subject by legislative bodies. In more than half of the states, beyond making provision for establishing and maintaining cemeteries, no attention whatever has been paid to the disposal of the dead. In but one or two states has the possibility of contamination of water supplies by drainage from burial grounds been considered; and few have by legislative control guarded the dangers attending the disposal of the body of a person dead of a contagious disease. A permit for burial, issued only after receipt of a proper certificate as to the cause of death, is absolutely essential to prevent dangers from contagion and to avoid concealment of crime; but the great majority of our states have made no provision for this. It is true that, as a rule, this measure is enforced by the local authorities in the large cities. In but few states have the health authorities been given any powers to regulate the location or use of cemeteries. Laws for the prevention of intra-mural burial have been enacted in several states, but they often fail in their purpose, the growth of cities gradually approaching and finally including the burial grounds.

A few states have provided against the dangers arising from the disinterment of bodies of persons who have died of a contagious disease. Three or four have regulated the depth of burial. Burial within churches is still permitted in the Province of Quebec. The laws of this province, however, provide against a danger which has not been recognised, as far as can be learned, in any other province or state. That is, permitting a body dead of a contagious disease, to be taken into a public receiving vault.

The laws of Massachusetts and New Jersey with reference to disposal of the dead seem to be superior, in most respects, to those of other states. A summary of these may be read, omitting, to save time, those of other states and provinces, which are included in the report.

MASSACHUSETTS.—Boards of health may make all regulations which they judge necessary concerning burial grounds and interments within their respective limits; may close any cemetery or burial ground within the city or town they may deem necessary to protect the public health: may prohibit any person unless appointed an undertaker or otherwise authorized by the board of health from burying or moving a deceased person.

No deceased person can be buried without a permit issued by a board of health on receipt of a certificate of death by attending physician or coroner. (Laws of 1885-7.)

NEW JERSEY.—Location of new cemeteries and extension of old ones must be approved by the municipal authorities and the local board of health, subject to revision by the state board of health. Descriptive map must be filed with the state board of health.

Top of outside coffin, for adults, must be buried four feet beneath the the surface; for children 3½ feet.

This does not apply to properly constructed private vaults.

Municipal authorities and boards of health are authorized to inspect cemeteries.

Disinterment of dead bodies is forbidden between May 1st and November 1st, except for purposes of criminal investigation. Forbidden at all times when death was caused by a contagious disease unless body is in a metallic, hermetically sealed case, and then only by order and under supervision of local boards of health.

Cemeteries may be closed by court of chancery on application of municipal authorities, local or state board of health. (Laws of 1885.)

A certificate as to cause of death must be given by attending physician or coroner in all cases. In cities or other local municipal government a permit to bury must be obtained in exchange for the death certificate.

Local boards of health may prohibit public funerals where death resulted from a contagious disease. (Laws of 1888.)

Many of the state and local boards of health have supplemented or strengthened the laws of their respective states with reference to disposal

of the dead; more especially with respect to the care of the bodies of those who have died of a contagious disease.

It will appear from the foregoing that our dead have been disposed of with but little control by any constituted authority, and without much attention to sanitary regulations; and yet, the harm, apparently, has not been great, and perhaps none at all, except where burial was in the crowded parts of cities.

There is a growing feeling that the dangers apprehended from cemeteries have been considerably overestimated. Before much was known about bacterial agencies of disease many evils which could only be conjectured were charged to cemeteries. As the science of bacteriology was gradually unfolded an explanation of how cemeteries may produce disease was afforded by supposing that the germs of infectious diseases, buried with their victims, infected the air and water in their vicinity. Outbreaks of contagious disease near burial grounds were often attributed to this cause without seeking for positive proof.

More recently many investigations have been made to determine the viability of pathogenic organisms in the soil, and the possibility of their infecting surrounding water and air in earth burial of the dead. Koch, Kitasato, Heser, Esmarch, and Petrie agree in discrediting the claims of Pasteur that the earth worm may bring the spores of anthrax, buried with cattle, to the surface and renew the disease in cattle feeding in such burial grounds. Dr. Petrie's experiments showed that the bacilli of cholera, and typhoid fever, when injected into animals which were killed and buried, lived but a short time. Reimer's investigations in cemeteries at Jena did not show any increase of bacterial life along side or beneath dead bodies as compared with control ditches dug in similar adjoining soil. Proskauer, in Berlin, met with the same results.

The bacteriological examination of wells in cemeteries has failed to demonstrate contamination. A series of monthly chemical analyses of the water from the wells in cemeteries in the city of New Haven, Connecticut, were made by Dr. Herbert E. Smith in 1889-'90. Summing up the results he said, "It would seem to justify the inference that a cemetery with a deep sandy sub-soil would be very unlikely to contaminate the ground water at any considerable distance from the cemetery." This agrees with the conclusions of Prof. Fleck, who examined the water from cemetery wells at Dresden.

In 1875 Dr. Adams of Massachusetts made an exhaustive report on disposal of the dead, which is published in the report of the Massachusetts state board of health for that year. He said "In summing up this investigation, we cannot avoid the conclusion that, as far as it goes, it shows that any injurious influence exerted upon the public health by burial grounds, as at present managed in this state, as well as throughout the United States, is almost unknown."

In spite of the lack of evidence to convict burial grounds of being a

cause of disease we are far from urging that they are, under all circumstances, free from such danger. We have conditions very similar to earth burial in the deposit of fecal matter in holes in the ground. Bacteriologists tell us that the bacilli of cholera and typhoid fever are soon destroyed in such places, but we have many instances which seem to conclusively prove that a well near such a vault may be infected.

On the other hand one of us has knowledge of two cities built on deep beds of sand and gravel where it has been the common practice for years to construct open cess-polls equal in depth to the wells. Typhoid fever has not prevailed to any great extent in either of these places, and those still using well water have not suffered more than those using the public supply, taken from another source.

Doubtless the character and condition of the soil largely determine the danger in such cases, and such is probably true, to a greater or less extent, in earth burial.

From present knowledge we would summarize our conclusions as follows:

1. Cremation is to be favored as a safe and cleanly method of disposing of the dead.

2. Cremation in the United States, at least for many places, needs farther safe-guarding to prevent concealment of crime.

3. Earth burial, under proper conditions, is also a safe and satisfactory method for disposal of the dead.

4. The location, preparation, and use of burial grounds should be controlled by statutes, under the direction of boards of health.

5. Intra-mural burial should be prohibited; and a considerable space in which there should be no burials should be provided around the outer areas of cemeteries to prevent the encroachment of dwellings.

6. Cemeteries should have a loose, porous soil, underdrained; and precautions be taken to protect sources of water or ice supplies from such drainage.

7. Closed vaults, and indestructible receptacles or coffins for the dead, should not be used, the body being permitted to return to dust as rapidly as possible.

8. Separate graves, with sufficient space between them, should be required.

9. No one should be permitted to dispose of a corpse without a permit from a proper authority, to be issued only after satisfactory evidence of the cause of death.

10. Only licensed undertakers should be permitted to dispose of the dead, and under such restrictions as may be imposed by health authorities.

11. The body of a person who has died of a contagious disease should not be permitted in a public receiving vault; and public funerals in such cases should be prohibited, special precautions being taken to guard

against the conveyance of contagion by those who have been associated with the deceased.

Public Statutes, and Regulations of State and Provincial Boards of Health *in re* Location and Regulation of Burial Grounds and Disposal of the Dead:

UNITED STATES.

ALABAMA.—Physicians required to give certificates of death to the county health officers. "No law requiring burial permit. Most cities and towns have ordinances requiring such permits" (Dr. Cochrane, state health officer).

CALIFORNIA.—The bodies of those ten years of age and upwards must be buried in graves 6 feet deep; of those under ten, 5 feet. Disinterment permitted only on order of board of health, health officer, coroner or mayor, issued on certificate from coroner or attending physician, giving cause of death, etc. Body must be enclosed in a sealed metallic case or coffin. (1878.) In incorporated cities or counties burial permits must be obtained from the health officer or board of health issued on death certificate of attending physician or coroner. (Laws of 1889).

COLORADO.—Cemeteries located in cities, towns, and villages may be vacated by order of a county court on petition of the local board of health. (Act of 1893.)

Disinterment of dead bodies is forbidden except by permission of the state or local board of health. (Rules of State Board of Health.)

In the city of Denver death certificate is required of physician or coroner, and burial permit must be obtained from the board of health. (Laws of 1895.)

CONNECTICUT.—Cemeteries not hereafter to be located within 600 feet of any ice pond, nor any ice pond to be located within 600 feet of any cemetery unless the ice pond is on higher ground. (Laws of 1889.)

No cemetery hereafter to be located within one-half mile of any reservoir furnishing a public water supply, and no such reservoir to be located within one-half mile of any cemetery. Subject to revision by county superior court. (Laws of 1884.)

Town registrar issues burial permit on receipt of death certificate given by attending physician or medical examiner.

In contagious diseases the undertaker must, in addition, give the registrar a sworn statement that the body has been prepared according to the rules of the state board of health. (Laws of 1893.)

DELAWARE.—"The bill passed by our legislature regulating the disinterment, burial, and removal of dead bodies in this state is lost, and therefore we have no law upon the subject except in the city of Wilmington." (Dr. Frazer, secretary, state board of health.)

FLORIDA.—"No laws on burial, or regulating location or management of cemeteries. In large towns regulated by ordinance." (Dr. Porter, secretary, state board of health.)

Rules of state board of health provide that dead bodies shall not be distinterred between April 15th and December 1st. When dead from contagious disease not until two years after death, and then placed in a "practically air-tight case."

ILLINOIS.—Trustees may decide and direct the depth that graves shall be dug. (Laws of 1887.)

Rules of state board of health prohibit public funeral when death is due to a dangerous contagious disease.

INDIANA.—"No state laws regarding disposal of the dead. Burial permits only required in large cities." (Dr. Metcalf, secretary of state board of health.)

Rules of state board of health prohibit cemeteries within less than one mile of corporation limits of any town or city. Require private burial (coffin to be unopened) as soon after death as possible, when death is due to a contagious disease.

IOWA.—Municipal corporations have power to regulate the disposal of the dead. Rules of the state board of health, recommended for adoption of cities, towns, and local boards of health, provide for a burial permit, issued by clerk of the board of health on receipt of certificate of death by attending physician or coroner.

Rules provide that disinterment shall only be permitted by authority of state board of health. No disinterment permitted when death is due to Asiatic cholera, small-pox, scarlet fever, leprosy, typhoid (?) fever, or yellow fever.

KANSAS.—Rules of state board of health require that in death from contagious disease the body shall be wrapped in a disinfected cerecloth, enclosed in an air-tight coffin and allowed to remain in the sick room until removed for burial. Public funerals in such cases not allowed.

Disinterment only on permission and under direction of local board of health.

MAINE.—"Cemeteries shall not extend nearer than 25 rods to any dwelling house against written protest of the owner." (Dr. Young, secretary of state board of health.)

Death certificate obtained by undertaker, who presents it to the city or town clerk, who issues burial permit.

Certificate is not required where it is impracticable to obtain it within reasonable time after death. (Laws of 1895.)

MASSACHUSETTS.—Boards of health may make all regulations which they judge necessary concerning burial grounds and interments within their respective limits; may close any cemetery or burial ground within the city or town that they may deem necessary to protect the public health; may prohibit any person unless appointed an undertaker, or otherwise authorized by the board of health, from burying or moving a deceased person.

No deceased person can be buried without a permit issued by a board

of health on receipt of a certificate of death by the attending physician or coroner. (Laws of 1885-7.)

MICHIGAN.—The trustees of any incorporated village, or council of any city, may cause any cemetery to be vacated when it endangers the health of the people living in its vicinity, but not during the months of June, July, August, or September. (Sce. 4,790 of the R. S.)

No person dead of any dangerous communicable disease may be brought into any township, city, or village, without a special permit from the board of health or health officer, and under the health officer's supervision. (Laws of 1895.)

MINNESOTA.—Physicians are required to report to local boards of health the death of any of their patients who shall have died of a contagious disease within 24 hours thereafter.

Corpse shall not remain unburied longer than four days, or if death is caused by contagious disease not longer than 24 hours after death, without permit from local board of health. If death is due to a contagious disease the said board may cause the body to be disinfected, and tightly sealed in a coffin, which shall not be opened. Funeral in such cases must be private. (Laws of 1893.)

NEVADA.—It is unlawful for undertaker or other person to bury any deceased person who has died in any incorporated town or city in the state without having first obtained a certificate from the attending physician or coroner. This permit, before burial, to be returned to the coroner of the county where the deceased died.

County commissioners may authorize disinterment of dead bodies when, in their judgment, it will not endanger the public health, provided the person to be disinterred did not die of a contagious or loathsome disease. (Laws of 1865.)

NEW HAMPSHIRE.—No cemetery shall be laid out within 20 rods of any dwelling house, store, or other place of business without owner's consent. (Chapter 51, Sec. 2, R. S.)

Cause of death must be certified to by attending physician. "No dead body may be buried without a permit. In cities no permit issued till application has been passed upon by the board of health." (Dr. Watson, secretary of state board of health.)

NEW JERSEY.—Location of new cemeteries and extension of old ones must be approved by the municipal authorities and the local board of health, subject to revision by the state board of health. Descriptive map must be filed with the state board of health.

Top of outside coffin, for adults, must be buried 4 feet beneath the surface; for children 3½ feet.

This does not apply to properly constructed private vaults.

Municipal authorities and boards of health are authorized to inspect cemeteries.

Disinterment of dead bodies forbidden between May 1st and November

1st, except for purposes of criminal investigation. Forbidden at all times when death was caused by a contagious disease unless the body is in a metallic hermetically sealed case, and then only by order and under supervision of local board of health.

Cemeteries may be closed by court of chancery on application of municipal authorities, local or state board of health. (Laws of 1885.)

A certificate as to cause of death must be given by attending physician or coroner in all cases. In cities or other local municipal government a permit to bury must be obtained in exchange for the death certificate.

Local boards of health may prohibit public funerals where death resulted from a contagious disease. (Laws of 1888.)

NEW MEXICO.—Municipal corporations may establish and regulate cemeteries within or without corporation; may cause cemetery to be removed, and prohibit them within one mile of corporation. (Laws of 1884.)

Burial prohibited within 250 yards from either side of a river or stream. (Laws of 1889.)

An act of 1889, appointing boards of health, forbids carrying a contagious corpse through streets or roads, or into any church with coffin open and body exposed. "This was a common practice with the Mexicans, even in small-pox." (Dr. Atkins, secretary of territorial board of health.)

NEW YORK.—Local boards of health are required to "prescribe sanitary regulations for the burial and removal of corpses."

The undertaker is required to secure a certificate of death from attending physician or coroner and must present this to the local board of health to obtain a permit for burial or removal. (Laws of 1893.)

The board of supervisors of any county may make such regulations in regard to burials as the public health may require.

No cemetery shall be located within less than 100 rods from any dwelling, without the owner's consent. (Laws of 1854.)

NORTH DAKOTA.—"No law regulating location or use of cemeteries except that bodies must be buried with 4 feet of earth on top of the coffin." (Dr. Montgomery, state superintendent of health.)

Corpses must be buried within 4 days after death, and where death was due to a contagious disease, within 24 hours after death, except by permission of the local board of health. In contagious diseases the funeral shall be strictly private, and only such hearses or other vehicles shall be employed in the removal of the body as may be authorized by the board of health.

Undertakers are required to have death certificate from attending physician or undertaker, which he files with the board of health after burial of the body. (Laws of 1893.)

OHIO.—Cemeteries not permitted to be established within 200 yards of any dwelling house, unless owner consents. In enlarging a cemetery it

shall not be nearer than 100 yards to any dwelling house erected subsequent to the location of the cemetery. (Laws of 1891.)

Disinterment of dead bodies prohibited from April to October, and at all times when death was due to a contagious or infectious disease. (Laws of 1894.)

Villages shall not have the power to prohibit interments in any cemetery in their limits unless it can be shown that such interments are detrimental to the public health. (Laws of 1889.)

The erection and maintenance of crematories authorized, but their use prohibited nearer than 300 yards to any dwelling house without owner's consent. (Laws of 1893.)

No person is permitted to remove or convey a corpse for burial to or from any city, village, or township, without a permit from the local board of health. (Laws of 1893.)

Rules of the state board of health prohibit public funerals in deaths from contagious disease. Prohibit disinterment of corpse without a permit from that board.

OKLAHOMA TERRITORY.—Rules of territorial board provide that no cemetery shall be located nearer than one mile of any town, city, or source of any public water supply or water works.

Disinterment between December 1st and April 15th on permission of the local board of health; between April 15th and December 1st on permit of local board endorsed by territorial board.

Bodies dead of a contagious disease cannot be disinterred until three years after burial unless the burial grounds in which they are placed should become a menace to public health, and then only by consent of local and territorial board and under supervision of the local board.

Public funerals prohibited when death was due to a contagious disease.

PENNSYLVANIA.—Unlawful to bury the dead in land draining into any stream furnishing in part or in whole the water supply of any city. Not applicable to land now used for burials. (Laws of 1895.)

Cremation of a dead body forbidden without a permit from the health authorities of the place where the body is cremated. Permit only granted on presentation of death certificate from attending physician or coroner, signed by undertaker and person in charge of the crematory.

Rules of state board of health prohibit public or church funeral in death from contagious disease. Prohibit exhumation between May and October; and in case of contagious disease only by permission of and under conditions imposed by the state board of health.

TENNESSEE.—No law on the disposal of the dead other than one prohibiting burial within municipal corporations or taxing districts containing 36,000 population.

"Most cities and towns have ordinances requiring permit for burial." (Dr. Lindsley, secretary, state board of health.)

TEXAS.—"Burial regulated by local authorities. Permit for burial required in every community." (Dr. Swearingen, state health officer.)

VERMONT.—In establishing or enlarging burial grounds they must not be within 12 rods of any dwelling house, and remains must not be buried within 20 rods of such house. (Laws of 1878.)

Private burial required immediately after death of any person dying of Asiatic cholera, small-pox, typhus fever, or yellow fever. (Laws of 1892.)

Rules of state board of health require private funeral where death resulted from a dangerous contagious disease.

VIRGINIA.—Cemeteries prohibited from being established within the limits of any incorporated city or town, or within 400 yards of any residence without consent of the owner.

WASHINGTON.—Rules of the state board of health require interment within 12 hours after death in case of small-pox, and private funeral in all contagious diseases.

WEST VIRGINIA.—"No laws or regulations regulating disposal of the dead. No permit for burial. No special rules for prevention of contagion in connection with disposal of dead bodies." (Dr. Baker, secretary, state board of health.)

WISCONSIN.—Cemeteries may not be established within one mile of any erected building within the limits of any recorded plot in any city or village; nor established outside any city or village within 200 rods of any inhabited dwelling in any recorded plot in any city or village, without the consent of the municipal authorities of such city or village. (Sec. 1454, Laws of 1887.)

Certificate of death required of attending physician, "Not enforced outside the city of Milwaukee." (Dr. Wingate, secretary, state board of health.)

Rules of state board of health require burial within 24 hours after death when due to a contagious disease.

CANADA.

MANITOBA.—The provincial board of health is authorized to provide rules for the safe and speedy interment of the dead, and conduct of funerals, for the prevention of contagious disease.

Attending physician required to notify the health authorities of deaths caused by a contagious disease.

NEW BRUNSWICK.—Rules of the provincial board provide for private funeral where death is due to a contagious disease. Body to be disinfected, to be enclosed in a metallic or air-tight coffin which must not be reopened. Coffin not to be taken into any church.

In cities and incorporated towns permit for burial must be obtained, which is issued only on satisfactory statement of cause of death, etc.

NOVA SCOTIA.—"No law on the disposal of the dead other than ordinary cemetery regulations."

No special rules of board with reference to burial in contagious diseases.

In city of Halifax death certificate and burial permit required. (Dr. Reid, secretary, provincial board of health.)

ONTARIO.—"There are no laws relating to the burial of the dead except those which govern cemetery companies, and those which relate to the burial of contagious corpses.

"Proposed regulations re-burial and transportation, are still under consideration by the government." (Dr. Bryce, secretary, provincial board of health.)

QUEBEC.—Cemeteries located by diocesan authorities on request of their parishioners. Must be as far as possible beyond probable limits of the town or village, on elevated land inclining opposite to the town or village to prevent contamination of drinking water.

Disinterment of dead bodies permitted on order of judge of superior court, but not more than one body at a time, between June 1st and September 1st.

Where death is due to contagious disease disinterment permitted only after 5 years, or such time as may be fixed by the provincial board of health.

Superior or diocesan ecclesiastical authority may prohibit interment in any cemetery or church.

Bodies may be interred in church if coffin is covered with 4 feet of earth, or placed in stone vault 18 inches thick, or brick 20 inches thick, disinfectants to be used in the coffin.

Where death is due to contagious disease church interment or vault deposit is prohibited. Bodies must be in separate graves with 4 feet of earth over coffin. In non-contagious diseases 3 feet of earth permitted. Interment in private vaults, in contagious diseases, permitted if body is in hermetically sealed coffin.

Provincial or local boards of health may prohibit dead bodies being taken into a church during an epidemic of a contagious disease on written permission of a local or diocesan ecclesiastical authority. (Chapter XLVIII as amended.)

"Except in cases of suspicious cause of death, for which coroner's permit is required, all permits for disposal of the dead are given by the clergyman of the deceased's denomination." (Dr. Pelletier, secretary, provincial board of health.)

In the following states and territories no laws could be found which in any way relate to the sanitary aspect of the disposal of the dead: Alabama, Arizona, Arkansas, Delaware, Florida, Georgia, Idaho, Indiana, Indian Territory, Kansas, Kentucky, Louisiana, Maryland, Mississippi, Missouri, Montana, Nebraska, North Carolina, Oregon, Rhode Island, South Carolina, South Dakota, Texas, Utah, Washington, West Virginia, Wyoming.

THE DISPOSAL OF THE DEAD, WITH ESPECIAL REFERENCE TO THE PREVALENT PRACTICE OF EMBALMING.

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From remotest antiquity to the present time, topics relating to the disposal of dead bodies have been universally interesting. No subject has been more carefully studied from all points of view, and yet it is not inconsistent with facts to state that no material advancement as to methods of preservation or final disposition has been made over those which were practised more than twenty centuries ago. Indeed, there is a growing belief in the public mind that to return to the custom generally in vogue previous to the Christian era (cremation) would solve many perplexing problems with which sanitarians are not unfamiliar.

Anciently, in Egyptian countries, where the surrounding atmospheric conditions were favorable, the dead bodies of human beings were embalmed and the mummified remains indefinitely preserved. The Jewish nations entombed their dead in rock-bound receptacles called sepulchers. In Greece and Rome the practice of cremation obtained, while it appears that we probably owe to the ancient Chinese the origin of the common method at the present date, viz.: that of interment, or earth-burial.

For ages this absorbing subject has been surrounded, modified, and in various ways influenced among people of all classes, conditions, and climes by vexatious questions, relating for the most part to sentimental, religious, sanitary, and medico-legal considerations.

It will be the purpose of this paper, in the briefest manner consistent with intelligent description, to invite the attention of this body to some questions which have especial reference to the two last-named considerations.

According to early chronological records no branch of art was cultivated in higher degree than that of the embalmment of the human corpse. Affection and superstition (always the greatest motive powers of the world) together with the prevalent fanciful ideas associated with death and subsequent everlasting life, all combined to give the greatest prominence to the extraordinary, elaborate, and costly methods which were employed in the remote periods of civilization for the preservation of dead bodies in order that they might be kept uninterred.

As to means and methods, they were chiefly—evisceration and cleansing; salting and bituminizing; the insertion into the emptied three great cavities of antiseptic balms and spices; dessication by favorable atmospheric surroundings, and the subsequent bandaging with expensive muslin and linen fabrics; the painting, gilding, and marking of the hermetically sealed cases provided for their final reception—all of which consumed

a period of time amounting to seventy or seventy-five days. The final result of this process of mummification was to render the body as inoffensive in a sanitary sense as a block of wood or stone, and specimens of the remains of ancient kings and noblemen have been discovered, and are on exhibition, who lived and flourished at various epochs from 4000 years before to the time of Christ, when the opposition of the priests inhibited the custom and caused the complete decadence of the art and its consequent abandonment, until the discovery of the circulation of the blood suggested an easier, less costly, and quicker method for the accomplishment of the desired purpose.

The great anatomist and surgeon, William Hunter, in the latter part of the eighteenth century, practised the injection of essential oils through the principal arteries for the preservation of anatomical subjects; but it was not until about the year 1835 that antiseptic solutions were used in this manner for the purpose of embalming, when the custom was inaugurated, simultaneously it is said, by Drs. Lauth of Strasbourg, Franchini of Naples, and Gannal of France. Various substances were then used—as chloride and sulphate of alumnia, arsenic, zinc, and mercury—the preservative power of which had been established. Since that time to the present date nearly every substance known to have properties in any degree antiseptic when applied to animal tissues has been employed for the purpose and it would be quixotic to attempt the enumeration of the various formulas which have been from time to time proposed. It is perfectly proper to remark, however, that, taking the customs and achievements of the people of ancient times for the standard in this regard, the modern practice of embalming has been steadily degrading in skill and usefulness by being placed, without legal control or restriction, almost entirely into the hands of the ordinary undertaker who is ignorant in most instances of the principles involved. The practice of injecting the blood-vessels has undergone of late a sort of degeneration, and as a consequence of the hasty and superficial manner in which this operation is now performed, circumstances are too frequently encountered which are a menace alike to the welfare of society in general, and to public sanitation; and it is the special object of this article to call attention thereto with a view of securing the endorsement of this great and influential organization of the effort which has been and is being made in the state of New York to regulate the practice by statutory enactment, to be followed it is hoped by similar action in every other state of the Union.

I presume there are very few men of experience present who will not join me in the assertion that the method of embalming at present in use by the so-called funeral director is not worthy of the name. It may be briefly described as follows: Theoretically (and practically in a small proportion of cases) one of the principal arterial branches of the body, usually the brachial near the elbow bifurcation, is exposed and laid open, (generally with questionable skill), and a variable quantity of one of the innumerable fluids is pumped by means of a syringe into the artery sup-

posedly in the direction that the blood naturally flows. These fluids almost invariably contain in composition one or more, or all, of the preparations of mercury, arsenic, zinc, and carbolic acid. More often, and almost without exception in remote districts, this process is carelessly modified so that the operation consists in simply forcing the liquids into the thoracic and abdominal cavities through a trocar, and also by means of rubber tubing, into the rectum and *per orem* into the stomach. It is supposed that the result of this is to preserve the body in a sanitary and presentable condition for ceremonial purposes previous to burial. There is little doubt that if the proper injection of the blood-vessels is carefully done, with the required anatomical skill, such a result could be achieved with satisfaction, but it is obvious that when done in the incomplete and unscientific manner last referred to, the preservative effect is almost, if not quite, *nil*, and if it were not for the ordinary precautions commonly practised by the friends of the deceased themselves, the corpse would in most instances become a public nuisance in high degree before the final disposition.

The growing tendency to this careless and superficial treatment on the part of the undertaker, without legal regulation to obviate it, is the doorway to an enormous and systematic deception—a commercial fraud in fact, as a comfortable fee is charged for the service.

To illustrate, I will not attempt to burden my remarks by citing numerous examples, which might very readily be done, but will simply mention one familiar case which is well in point because it was an instance where inutility was abundantly demonstrated when every facility was offered, and the conditions were unusually favorable. I refer to the notable case of the late General Grant, whose lamented death although for a long time previous an anticipated event was considered a national calamity. It would naturally be supposed that in such an instance extraordinary precautions would be taken to preserve the remains for the elaborate and extensively planned ceremonies incident to the occasion. Presumably the body was embalmed in accordance with the methods in vogue, and doubtless with the best skill obtainable. A few days later when the funeral train reached Albany on its way from Mount MacGregor to the final resting place at now famous Riverside Park, a countless multitude of interested and admiring people were shocked to observe that no semblance of the well-known features of the distinguished military chieftain was recognizable. Suggillations, together with many other evidences of rapidly advancing decomposition, were apparent in spite of the fact that diligent effort was made to conceal them.

There can be no doubt that the public health was in great degree endangered by the unpleasant circumstances.

This is typically illustrative of frequent occurrences of the kind in common observation, and I am led thereby to feel justified in declaring that there is a strong argument apparent herein in favor of legislation of such character as will lead at least to the modification, if not the prohibition,

of a so-called embalming process which as practised in a great proportion of instances neither accomplishes the intended purpose to prevent putrefactive changes with their attendant odors and appearances, nor properly conforms to common principles in public health administration.

The other phase of this subject to which I desire to direct attention might be said to deal rather with *public morals* than with *public health*, but it seems that no apology is due for the reference as those two titles so closely merge into each other in practice as to suggest that the medico-legal aspect comes properly within the scope and purview of the fundamental principles of this organization.

A case which I here quote from one of my previous papers[1] will also serve as a type in illustration: "Mr. E. A. P., a medicine vender, aged about 75 years, a short time after marrying his third wife died with somewhat obscure symptoms after an illness of seven days. Sometime after his burial suspicion was aroused on the part of his relatives that his death was not due to natural causes, and an investigation was instituted. I was employed by the authorities to exhume the body and ascertain if possible the actual cause of death.

"The body was found to be partially decomposed. The viscera of both the thoracic and abdominal cavities were carefully removed and properly prepared for subsequent chemical analysis with a view to the establishment of the presence of poisons.

"The analysis demonstrated unmistakably the presence in the materials examined of arsenic, mercury, and zinc in large and lethal quantities.

"About this time I was informed in a casual manner that the body had been enbalmed by the undertaker who had charge of the interment, and upon inquiry it was ascertained that such was the case. The body had been treated in the following manner: a so-called embalming fluid was injected into the principal artery of both arms and openings were made into the thoracic and abdominal walls through which a quantity of the same liquid was thrown into each of those great cavities. Inquiry was made of the manufacturers of the liquid as to its composition. They admitted that it contained in solution the chloride of zinc and the bichloride of mercury, but denied the presence of arsenic in any form. A sample of the fluid was then procured and analyzed. The analysis revealed that it contained, besides other unimportant ingredients, the very salts and compounds found in the remains—those of arsenic, mercury, and zinc—the revelation of, and testimony upon which, together with other suspicious facts, were to be relied upon by the prosecuting officers to constitute the *corpus delicti* in the action. It was therefore impossible to determine whether these poisons were introduced into the body before or after death, and, for obvious reasons, the case was dismissed from the courts as a consequence. Although subsequently a careful re-examination of the suspected tissues was made by cutting them into fine pieces and re-

[1] Transactions Medical Society of the State of New York, 1888.

peatedly washing them in chemically pure water until all traces of the poisons were lost in the washings and the remaining substances, after being dried and analyzed, still showed the presence of the metals mentioned (thus indicating probable ante-mortem absorption), no chemist would dare to express a positive opinion that, beyond reasonable doubt, the case was one of ante-mortem or post-mortem poisoning."

This is a striking example of cases which have been occurring in great numbers in recent years, and are at present increasing in frequency. I do not hesitate to venture the opinion that there is no chemist of any considerable medico-legal experience who has failed to meet with similar instances, and the subject is now receiving the careful attention of many lawyers, judges, physicians, prosecuting officers, and, to some extent, legislators, with a view to the enactment of such laws relating to the disposal of dead bodies as will insure proper protection in this respect, and meet at the same time the requirements of sanitation, with due and proper regard for the demands of sentiment. The menace to the welfare and safety of the public is evident in the premises indicated by this case, and I feel sure that its various relations will be at once appreciated.

It seems that no one can fail to observe the opportunity offered herein, to a criminally disposed individual, to commit and subsequently conceal the crime of murder by poisoning, it simply being necessary that he should make sure that the body of the victim is treated in the manner referred to. That this opportunity is frequently taken advantage of at the present time, is a well-known and indisputable fact among those of us who are concerned in such investigations, and I might consume the entire time of this session by reference to cases of such character which have come within my knowledge during several years past, and while the subject of relative legislation has been pending in my state.

Obscurity of symptoms leading to confusion as to diagnosis, lack of suspicion, together with the fact that the perpetrator is frequently able to control the extent and character of the medical attendance himself, the ease with which a careless and inefficient undertaker may be procured to make himself, unwittingly, a *particeps criminis*, all combine to favor the accomplishment of a criminal purpose, especially if it is the result of intelligent design, as is generally the case. It is a remarkably suggestive fact in this connection, that between the years 1858 and 1892 not a single case of murder by poisoning was tried in the courts of the great city of New York. Is it reasonable to suppose that no such murders were committed in that city for a period of about thirty-five years? The statistics of London and Paris showed an average of three such cases yearly during that time.

It will be observed that in consequence of this pernicious practice of embalming it is just as difficult to establish the *innocence* as the *guilt* of persons who may be accused. By the toleration of the law, or the want of specific legal direction, this practice of alleged embalming has come to be an enormous offense to the public health and to certain other public

interests, and the subject is worthy of the most careful attention. Ignorant men are taught, or teach themselves, to believe that the injection of a quantity of irritant metallic poisons in solution into the interior of the body anywhere, is sufficient to effect preservation and secure their fee, and embalmment *secundum artem* is now practically fast growing to be a thing of the past in this country. Gallons of poisonous solutions are squirted into bodies indiscriminately which are in an incredibly short time imbibed by other bodies in cemeteries, saturate, and are absorbed by, contiguous soils and streams and also wells that are fed by subterranean waters which receive the percolations of graveyards filled with bodies thus treated. For example, a recent examination of the waters of Scajaquada creek, which flows through Forest Lawn Cemetery in the city of Buffalo, demonstrated the presence of considerable quantities of arsenic of the kind commonly used in the prevalent method of embalming. In the belief that hasty treatment is necessary to obtain the preservative effect of the arsenical solutions now universally employed, the undertaker, in the absence of proper legal requirement to the contrary, seldom awaits the issuance of the death certificate, and I am rarely called to make an autoptical examination that I do not find that his operation has preceded and in fact *superseded* mine.

The movement for the purpose of bringing about controlling legislation in these circumstances began in 1888, and was the outcome of a paper which the writer had the honor to read before the Medical Society of the State of New York.

A bill with prohibitive provisions was introduced into the legislature with the approval of the State Society, and its Committee on Legislation was directed to use all proper means to effect its passage. This bill was violently opposed by the State Undertakers' Association and persons engaged in the manufacture and sale of the objectionable solutions used. Although the praiseworthy object of the measure was so far appreciated by the legislators that it was passed in an unusually rapid manner to an advanced parliamentary standing, the opponents by superior political tactics succeeded in preventing its being placed upon its passage, and it accordingly died for that session in the committee-room.

The public attention was attracted to the proposition, however, and favorable efforts were at once undertaken by many eminent persons who readily recognized the importance of the subject, including judges, health authorities, lawyers, chemists, and physicians.

Two years later another bill was introduced in the form of an amendment to the Penal Code. This was not so sweeping in character as to the prohibitive restrictions of the former bill, but permitted of embalming "by the injection of any substance into the body only with the written consent of the attending physician and also of the coroner having legal custody;" prohibited "the injection of or placing upon the body of any solution containing arsenic, zinc, mercury, or carbolic acid, except in cases of persons dead from contagious diseases, by officers of boards of health, or

for the preservation of bodies for dissection in legalized medical colleges."

This bill was actively advocated by a large number of the friends of the reform, and able addresses were made at the hearings by Professor Witthaus of New York, Hon. Tracy C. Becker, president of the State Bar Association, Prof. R. Ogden Doremus, Hon. Clark Bell, Judge Brady, and others.

The bill was favorably reported by the committees of both houses to which it was referred, but owing to the vigorous effort of its opponents in the lobby it failed of passage—thus demonstrating once more the truth of the expression so familiar to sanitarians that "politics and science do not live upon the same street."

The measure has since been pending, and it is understood that a renewed and determined effort to correct the evil will be made during the coming winter with great prospect of success, as the sanitary phase of the subject has become so manifest by the abuse of the practice previously referred to, that a general regulation of the disposal of dead bodies by a revision of all laws relating thereto, is believed to be most urgently demanded.

The fact that this Association has very pertinently established a standing committee for deliberation upon topics germane to the subject under consideration is regarded by the friends of this reform as a very favorable circumstance, as it is beyond doubt that all the associated difficult questions will be studied from every point of view in connection with the work of the committee, and that it is very probable that the potent influence of this great organization may be secured to effect the enactment of laws with uniformity of requirement everywhere concerning the preparation for burial, cremation, or transportation of all dead bodies. These laws should have an intra-state, interstate, and international character, and I beg to remark that the Association could not at the present time lend its powerful aid to a project of vaster or more salutary importance to the public weal.

I trust sincerely that I have succeeded by this hastily prepared paper in presenting the legislative part of my subject in a sufficiently comprehensive manner that the way may seem clear for a reference to the committee with instructions to formulate an expression of endorsement, and report it for action by the Association at this meeting.

I have thus far said nothing regarding the innocuous substitutive methods which might be proposed to remedy the great evils which it has been the purpose of this article to expose.

The argument most commonly advanced by the funeral directors, in opposition to the passage of restrictive acts, is that they should not be compelled to submit to the hardship of relinquishing the use of the arsenical fluids which have been depended upon so long when no efficient substitute can be proposed.

Every chemist present knows that such an argument cannot be sus-

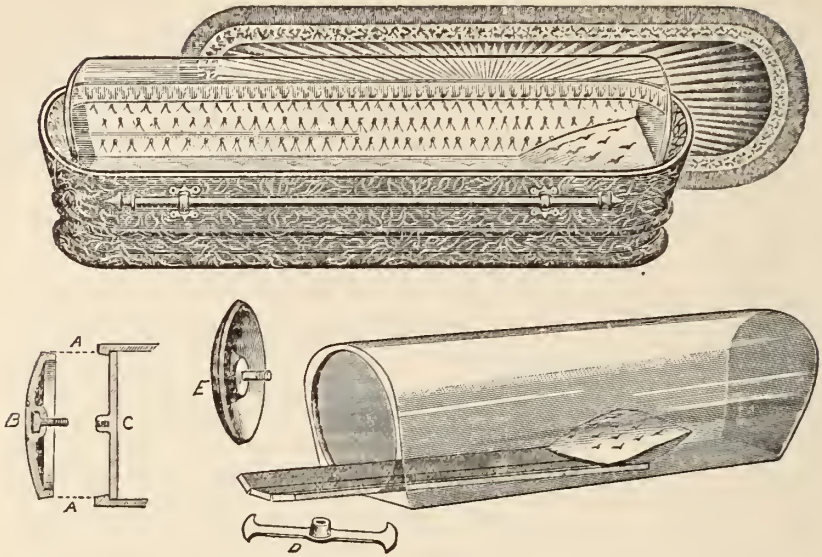
tained. The truth is that it is the *cheapness* of these mineral substances in solution which chiefly recommends them for this purpose. The fluids are supplied for not to exceed *thirty cents* per gallon by the manufacturers, and it is the interesting difference between the cost of the one or two gallons hastily thrown into the mouth and rectum, (as is now the almost universal custom of the ordinary undertaker), and the probable *thirty dollar* fee that furnishes the negative for such an argument.

I am sure that every scientific gentleman of experience in this audience will join me in the assertion that at least a score of substances might be mentioned as substitutes which have far greater preservative power than the arsenical solutions now in use. The cost would doubtless be greater in the case of most of them, but in view of the importance of the subject the slight reduction in the profits of the undertaker would, I think, be tolerated by the public. Even this objection would in due time be adjusted by commercial competition, and the relations of demand and supply. It must constantly be borne in mind, however, that no substance whether mischievous or otherwise would properly meet the sanitary requirements of the occasion that is not properly applied by its scientific introduction and distribution throughout the entire circulatory system of the body;—and what is aimed at in this proposed restrictive law is to make it a penal offence to do anything short of that, along with certain specifications of the materials which shall be used.

It seems apropos to call attention at this point to a recently devised burial casket which is designed to meet some of the objections which can for sanitary reasons be urged against most of the receptacles now made use of for transportation and burial. It is the invention of Dr. Julian P. Hill of Buffalo, N. Y., and is constructed entirely of glass with a tapering circular opening at one end only. An end-piece with ground edges is fitted and made fast to the open end. In lieu of a complete description I will pass a perspective and diagram view of the instrument which I have obtained from the inventor, and which will convey an excellent idea of its apparent merits. The caskets will weigh from twenty to sixty pounds according to size.

It may be claimed for it, and I believe not extravagantly, that it is superior because it is cheap, light, and durable; that it can be completely disinfected without trouble, and can be made absolutely air and gas tight; that the body may be preserved for ceremonial purposes, and transportation, a reasonable time without embalming; that it prevents saturation and contamination of the soil and pollution of the atmosphere in the vicinity of cemeteries, protects the remains from the action of soil, water, earth-worms, etc., and that it may be cremated with the corpse.

It appears that this would solve the problem presented by the interesting paper of Dr. Griffith at the Montreal meeting, as there would be no possibility of contagion from it, and it is sufficiently cheap to be within the reach of all classes.



HILL SANITARY BURIAL CASKET.

This burial casket is constructed entirely of glass, forming a cylinder with a flattened base, closed at one end; at the other, a circular opening, into which fits a circular end-piece E. The edges A of the end-piece are ground, fitting snugly into the circular opening, and it is held securely by being screwed into a cross-bar, C and D, placed on the inside of the casket. The remains are placed upon a properly draped slab and then introduced into the casket; the end-piece is screwed into the cross-bar, the ground surfaces come into contact and the body is preserved in an air-tight compartment for burial. If desired the glass casket may be placed in the ordinary wooden case, as shown in the illustration, or it may even be cremated along with the remains.—*Reprint from the Buffalo Medical Journal, August, 1895.*

In conclusion, permit me to state that the principal propositions for which I contend in the foregoing remarks are as follows:

1. That the scientific preservation of dead bodies has degraded in recent years to the extent that the prevalent system as now carelessly practised by the majority of undertakers, is inefficient and in many instances unsanitary.

2. That it constantly leads to complications in criminal prosecutions, and entirely precludes the possibility of accurate medico-legal investigations—thus constituting a menace to the welfare of society.

3. That salutary and non-complicating substitutes for the materials employed are available, and that thereby the abuse of the embalming process may be entirely and satisfactorily corrected.

4. That the great importance of this subject merits the careful attention of this Association through its committee on the disposal of the dead, and that proper legislation for restriction, and control should be earnestly demanded in the interest of public sanitation and the public weal.

CREMATION OR EARTH BURIAL, WHICH?

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Among the momentous questions of this generation, which, under the authoritative touch of the *experimentum crucis*, have progressed from the domain of theorem into that of demonstration, the subject of cremation as a substitute for earth burial, has become paramount.

It is only within the last quarter of a century that special interest in the benign old-time custom has been revived, under such auspices, and with such force and power, as to make it the leading hygienic movement of the time.

Previous to the year 1869, no organized effort avouching the necessity of a return to the usage of the aforetime, had been inaugurated, although the question had been considerably discussed in foreign medical societies and journals. In the year aforesaid, an international medical congress met at Florence, Italy, and the eminent medical teachers of that nation, Professors Colletti and Castiglioni, introduced and forcibly advocated cremation, as being a question of vital moment to the public health. The proposition was favorably received by the congress, and was approved with practical unanimity. In 1871, the International Medical Congress reconvened at Rome. Here the proposition was again presented, and again favorably received.

In April, 1874, a cremation congress was called at Milan by the well known doctors, Bono and Amati. Over five hundred physicians and scientists attended. The question was exhaustively debated, and the proposed reform unanimously approved. An appeal was formulated to the Italian parliament, asking that body to legalize cremation in the new sanitary code then being prepared. Previously to this Milan congress, more or less numerously attended, minor conferences had been held, during the intervals of the major congresses, in various cities of Italy. Public interest in the subject had further and markedly been aroused by numerous articles in the papers, and by appeals personally made by medical men of eminence to the Italian senate and chamber of deputies, and the decisive battle was on. It was very "meet and proper" that the world at large should be awakened to the vast importance of this purely sanitary method of disposal of the dead, by the scientists of a land where cremation prevailed as a national custom seven hundred years B. C. Indeed, in the antique world the usage was general, except in Egypt, where the state religion, based on the transmigration of souls, made embalming of the dead obligatory. In Judea, where they were sepulchered, and in China, where earth-burial was the rule, and where for ages that people have considered it to be a religious duty to bring home their dead, even

from foreign shores in order that they might lie in their native soil. The revival of the cremation idea promptly extended to other lands, and in 1874 was inaugurated in England, by Sir Henry Thompson, whose articles in the January and March issues of the *Contemporary Review* attracted wide public attention. Simultaneously, January 13, 1874, was effected the organization of the Cremation society of London. This body he founded. Its membership is drawn from all classes of society, scientific and social, and the active propaganda which began with its birth has never ceased. Its official publications have been numerous and effective, and its members have continuously appeared of record in the medical and secular press on this behalf. Under the stimulus of this society the fifth crematory in Europe was built at Working, Surrey, in 1879. To it is also due the publication of the admirable little volume of Eassie on "The Cremation of the Dead," and through it, "being dead he yet speaketh."

On the continent, also, the reform rapidly spread from Italy, and aggressive cremation societies arose and still flourish in Germany, France, Holland, Belgium, Switzerland, Denmark, Austria, and Portugal. This latter is the only European country, so far as I am informed, in which organized and violent opposition on part of the Catholic clergy, has appeared. But the advocates of this sanitary reform, there as elsewhere, were equal to the occasion. Their convincing arguments prevailed, and by the year 1891, cremation became lawfully optional in Portugal. The municipality of Lisbon has also decided that it shall be compulsory during epidemics. All the societies aforesaid, became, as soon as formed, untiring and aggressive promulgators of the doctrine of cremation, and within ten years after the renascence, the whole civilized "world was filled with the pious clamor" of a multitude of votaries, who affirm the demonstrative proposition,—earth-burial is inhumanity to man.

The phenomenal progress of the revival conclusively proved, that among thoughtful men and women there was a latent, general, and profound conviction that the time had come for a radical revision of existing burial methods in the interest of the public health.

In our own country, the key-note was struck about the time it was heard in England. Here the reform was specially fostered by the distinguished surgeon, the late Dr. S. D. Gross, and by Drs. F. J. LeMoyne, of Washington, M. L. Davis of Lancaster, Pa., and Hugo Erichsen, of Detroit, Mich. Dr. LeMoyne built the first crematory in the United States, at Washington, Pa., in 1875. Dr. Davis has been the devisor and constructor of a number since then. He, likewise, was the first to establish a paper in this interest, the *Modern Crematist*, which did yeoman service in the arduous educational campaign which was then being conducted. Whether it still lives I do not know. Dr. Erichsen was a contributor to this journal, and is the author of a volume entitled "The Cremation of the Dead," of which the accomplished Cobb speaks highly. I have not been so fortunate as to be able to procure a copy.

The reform grew slowly yet surely, but it was not until after seven or eight years of seed-sowing that the signs of the harvest began to appear. A rarely intelligent contingent of medical men, clergymen, and laymen, then materialized; cremation societies multiplied with rapidity; special literature in the form of monographs, magazine articles, and books, of which Augustus Cobb's "Earth Burial and Cremation" is an admirable specimen—followed each other in quick succession; and in 1891, that valuable organ of the new crusade, *The Urn*, was founded in New York city. This journal is yet vigorously alive, is well supported, and is effectively edited by Mr. Louis Lange. It is as powerful a propagandist as is *Die Flamme*, the pioneer cremation journal of Europe. *Die Flamme* is the organ of the Berlin Cremation Society, a body which had, in 1892, over one thousand members. This membership has doubtless largely increased since that date.

Within the past five years the benign idea has firmly entrenched itself in the very citadel of public appreciation. Its literature has been greatly enlarged, and this safe, pure, and beautiful method of the disposal of the dead, has often become a subject of discussion in the great newspapers of the land. No stronger evidence than this, of the present status of this question, could be adduced. The astute editors of those papers are always swift to hear and to interpret the heart-throbs of the people; and are ever ready to give to the reading world the conclusions experts have reached with regard to questions which nearly concern the public weal.

So powerful has been the impetus thus given to the gracious reform that it moves now almost by its own momentum. It is only a question of time when the hygienic revolution, formally begun in 1869, will have accomplished its righteous purpose. Then, every considerable city will have its own crematory, built in churchly style, having its mortuary chapel, whose "dim religious light" and appropriate decorations evince a proper respect for the dead. From such solemnizing surroundings, amid the tearful benedictions of friends and lovers, the placid corse, rescued from the worms and the prolonged and revolting putrescence of the earth-grave, whose pollution menaces the health and lives of the living, is reverently committed to the purifying incinerator, which "clothing the palpable and familiar with the golden exhalations of the dawn," *tuto, cito, et jucunde* resolves the effete earthly tabernacle of the soul into its primal elements.

I never think of a cremation but what I am reminded of the passing of Elijah: "And it came to pass as they went on and talked, that behold, there appeared a chariot of fire and horses of fire, and parted them both asunder, and Elijah went up by a whirlwind into heaven."

Speaking of the advancement this reform has made, I ought to state that among that remarkable people, the Japanese, whose evolution during the last generation from semi-barbarism to a high plane of modern civilization, has been one of the marvels of this wonderful century; cremation has made greater progress than in any other country. It was

estimated by Cobb in 1892, that 47 per cent. of the aggregate of that nation's dead were yearly incinerated, ten thousand annually being thus disposed of in the six public crematories of Tokio alone.

Previous to 1869, the year of renascence, not a crematory was existent in Europe or the United States. The first one was built in Milan, Italy, in 1874. This was duplicated at Lodi in 1876. In 1875 Dr. LeMoyne built the first one in America, at Washington, Pa. The first incineration in America was done therein, December, 1876, on the body of the celebrated Baron de Palm, and many will remember the newspaper excitement which that event produced. The episode was an object lesson to the public and markedly increased the interest intelligent people were beginning to take in this subject. Alike the "little cloud like a man's hand," which Elijah's servant saw from the top of Carmel, "arising out of the sea," it seemed to be of small moment and yet was prophetic of great results.

Since 1876, mainly through private enterprise, the number of crematories has largely increased. It was stated at a congress of cremation societies held in Vienna, in 1888, that there were then fifty active crematories in the world. Within the past seven years the number must have grown to nearly one hundred. The aggregate of annual incinerations also grows, as is shown by official reports.

In 1888 the legislature of New York appropriated twenty thousand dollars for a crematory on Swinburne Island for the use of the state quarantine station, thus setting an example that should be followed by every maritime commonwealth. This crematory cost the state five thousand five hundred dollars, and has been of vast service. It was erected after the plans, and under the supervision, of Dr. Davis, of Lancaster, Pa., who, as stated *ante*, has devised and superintended the erection of quite a number of these institutions in his own and other states.

In 1890 the municipality of Philadelphia erected a crematory in its public cemetery. The most recent great gathering of hygienists was the "International Congress of Hygiene and Demography" in London, Eng., August, 1891. The Iowa state board of health was there represented by its secretary, Dr. J. F. Kennedy. That congress was composed of representative medical men and other scientists from various countries of the world. In its section of state hygiene the question of cremation versus earth-burial was elaborately discussed. The chairman of the section, Sir Henry Thompson, opened the debate with an interesting and instructive paper. He took for a text the statistical fact, that, during the three years next preceding 1891, the deaths from zymotic diseases in England and Wales alone had numbered sixty-eight thousand three hundred and eighty-two annually, or about one eighth of the general mortality. He then proceeded, forcibly and convincingly, to speak of the malign influences exercised over the living by this enormous aggregation of earth-buried foci of infectious disease. He remarked,—"It is not too much to

say that this large number of deaths from maladies which are mostly preventable is itself partly due to the fact that the dead body is permitted to propagate disease in the living. Could we arrest at once and completely the injuriously active forces which pervade it, a marked diminution would be apparent in the progress of many a local pestilence. A long experience has demonstrated that all methods of dealing with the dead body, which have for their object its conservation entire, when charged with infectious elements, permit these to be disseminated, and have often occasioned fresh outbreaks, especially in periods of epidemic visitation. The intricate, continuous, and universally pervading natural net-work of water-courses beneath the surface of the soil, associated as it is with innumerable artificial wells, reservoirs, and channels of every description, for distribution of water and collecting sewage, from a system, unseen, yet scarcely imaginable in regard to its extent, by those who have not practically studied it, and realized the complexity of its ramifications. In a densely populated country this system presents, perhaps, the most formidable social health problem which the sanitarian has to encounter.

"The history of the chief epidemics of the last fifty years in this country, and of the local outbreaks of fever, small-pox, etc., offers innumerable examples of propagation and extension of these diseases, due mainly, if not entirely, to the failure to prevent poisoning of these water-courses, not only by excreta during life, but by dead bodies committed to the soil—bodies which are deposited there solely in obedience to a sentiment that it is necessary to preserve the integrity of their form and the unaltered condition of their elements—elements at that moment so destructive and so mobile."

Sir Henry, in statesmanlike phrase, thus concludes,—

"Finally, by this process (that of incineration) two great advantages are secured to the public:

"*First.*—A diseased dead body is rendered incapable of communicating any malady to the living.

"*Second.*—The assignment of large and desirable tracts of land throughout the country for the imperfect, and sometimes hazardous, process of purification by burial in earth, is rendered needless. Every acre hitherto thus devoted, may in process of time be made free for the production of food; or, in thickly populated neighborhoods, as open spaces for exercise and recreation, may be set apart forever to promote and maintain public health."

The points made by Sir Henry apply with equal force to our own country. Irrefutable testimony as to the dire results upon the health of the living of such avoidable contamination of the water supplies of numerous American communities, urban and rural, has long been before the public in official documents. Witness the revelations some years ago anent the contamination of the Croton river by the seepage of the eighty-three cemeteries and the innumerable farm-yards and cess-pools along its

banks. The reformation of the water-supply of the city of New York, it will be remembered, cost the city a colossal sum of money, no inconsiderable part of which was expended in the wholesale abrogation of ascertained sources of pollution. Witness, likewise, the official reports from the cemetery region in Newtown, Long Island, into which township thirty-five thousand bodies are annually carried for burial. The state of things existent here is a blot upon our boasted civilization. Certain soulless corporations, actuated by that familiar form of greed which has no respect for the command, "And as ye would that men should do unto you, do ye also in like manner to them," there, in their public lots, in trenches ten feet wide and fifteen feet deep, bury bodies in tiers of fifteen, thus packing fifteen hundred of God's departed poor into a space ten feet by two hundred! These trenches are kept open at one end until full—that is to say, for many weeks—and when finally filled are only covered with a thin film of earth. One of these Newtown abominations rigidly requires each grave to be two feet by seven, with no earth space between coffins! Further, it permits six bodies to be buried in each grave, thus putting eighty-four hundred festering dead into each acre of ground, at a profit to the owner ghouls of seventy-one thousand five hundred dollars annually, on each filled acre! In 1889 there were a million and a quarter of decomposing bodies in this township. Six years later—at this writing—this abhorrible menace to public health, this renate barbarism, must contain a million and a half of "earth habitants." Is it marvellous that Newtown has about the highest death-rate of any township in New York?

Another common phase of the question is the desecration of burial grounds in obedience to the demands of city extension. It is no unfamiliar sight, during such events, to see rotting coffins and partly decomposed bodies lying for hours exposed while awaiting removal; emitting noxious gases, which are reënforced by the deadly exhalations from the upturned soil, where for many years, under the auspices of those inscrutable chemists, the worms, the products of animal decomposition have unremittingly undergone the dual process of generation and dissemination. These poison fumes are often so obtrusively pungent as to asphyxiate the workmen engaged in the exhumation. Eassie mentions well-authenticated cases, collated from various sources, of grave diggers, who, in plying their calling have been, some dangerously, and others fatally, affected by the carbonic acid flowing from the graves they were excavating. The deleterious exhalations referred to above are not confined to the point of origin, but pollute the air at large, and, as has repeatedly been proven, develop deadly epidemics of germ disease. Nor on such occasions is it unusual to observe the bones from charity lots tossed hither and yon, later on to be collected perfunctorily for the purpose of reinterment in pits elsewhere. Have we any reason to criticise the loathsome conditions presiding over the burial places of the Chinese, when such things as those just described can be done with impunity in

our vaunted civilization "without our special wonder?" Did the far-seeing Master have us in mind when he said,—"And why beholdest thou the mote that is in thy brother's eye, but perceivest not the beam that is in thine own eye? Or how wilt thou say to thy brother: Let me cast out the mote from thine eye; and behold the beam in thine own eye." Is *verbum sat sapienti* to be taken "in a Pickwickian sense," or does it state a truth worthy of our learning?

And these are not exceptional instances of cemetery vandalism, and might be abundantly multiplied by illustrations drawn from statistical sources in Europe as well as in our land.

But to return: At the Congress aforesaid, only one voice was heard in advocacy of earth-burial. Mr. Sidney Haden is a scholarly man, but his conservatism seems to be akin to that which roasted Servetus—and smirched Calvin—sent Theist Bruno to the stake, and prompted uncomprehending priestly bigots to discipline Galileo. Haden warmly opposed cremation, mainly on account of the possibility of crime being thereby concealed; a medico-legal objection which has often been confuted. He made some points in his defence of earth-burial, which, if the abuse is to continue, ought certainly to be incorporated into laws. They are as follows: The condemnation of double coffins, and of coffins made of indestructible material, because they prevent speedy decomposition; the importance of ample soil intervals between coffins; the abrogation of the unwise custom of keeping the dead unburied for many days; and lastly, the discontinuance of costly funerals whereby the means of the survivors are so often sacrificed to a display which is a relic of barbaric days. His averment that cremation was an *unnatural* method of disposing of the dead was answered by Sir Spencer Wells, who affirmed that it was no more unnatural than earth-burial, or burial at sea; and he forcibly pointed out the dangers to the living from the large tracts of land polluted by burial. He illustrated his argument with a pertinent anecdote of Sir James Simpson, the discoverer of chloroform, who suggested to a lady consultant from Ireland that she take chloroform during her labor. She refused, declaring it to be unnatural so to do. Sir James asked her how she came from Belfast. "By steamer," she replied. Whereupon he remarked, "That was a most unnatural way: the natural way was to *swim*."

Nothing short of cremation, Sir Spencer held, would destroy the specific germs of zymotic diseases. The discussion was lengthy and full of interest. Mr. Haden, in his final reply, repeated emphatically his former averments, and said,—"As to the pollution of water: was not the Aldgate pump quite near a grave-yard, and yet one of the most wholesome in London?" His unfortunate query was promptly answered by Mr. Hart, who said,—"At my instigation that pump had to be closed, because of its deleterious properties." Strange that such a man as Haden should not remember that chemistry and its ally, the microscope, have often and often conclusively proved the clearest and most palatable

well-water to be dangerously loaded with the poisonous nitrates of animal decomposition! Unhappily, these maleficent masked batteries are not always discovered, and their soundless guns spiked, until the epidemics they begot have done a deal of deadly work. Another verification of Shakespearian axiom,—"Fair is foul and foul is fair."

The debate was concluded by Sir Henry Thompson, who offered this resolution,—

"*Resolved*, That cremation of the dead is a rational hygienic measure, which is especially called for where the death occurs from contagious disease."

The proposition prevailed by acclamation, practically, there being but four negative votes. As showing the interest the public took in this discussion, it is stated in the official organ that the room in which the section convened was crowded to excess, standing room being obtained with difficulty; and that the audience did not hesitate to express audible approval or disapproval of the various speakers on occasion. The applause was almost entirely given the advocates of burial reform.

The statutes of the various commonwealths of this country do not prescribe methods of interment, therefore cremation is not an unlawful method of disposing of the dead, as some "pelting, petty cavillers" have proclaimed. Hence, no appeals to state legislatures on this behalf are necessary. But organized and persistent petition endeavors should be brought to bear upon these bodies with reference to influencing the enactment of laws making it obligatory upon boards of health to incinerate the bodies of those dead from infectious disease. It seems to me that it is also our duty, as sanitarians, to foster in every way, the policy of the building of crematories, so that in time the means to the benign end may be brought directly to the people of each considerable municipality, thus doing away with the present enforced transportation expenses, which can illy be borne by the many, a fact that materially interferes with a general exemplification of the process.

Aside from the cost of a building the expense of a Siemien's reverberating furnace is not great, and is within the reach of even the smaller towns of the land. That cremation is the more economical mode of the disposal of the dead, notwithstanding the outlays on such structures, goes without saying when we compute the vast money cost to the public of avoidable epidemics. The economic argument is one of great weight in this utilitarian age, and now that sanitary science has demonstrated that the health of the living is also involved in the success of this movement, its ultimate triumph seems beyond peradventure.

It is not to be wondered at that the cremation idea has met with opposition, for from the time of the Master to this present, such has been the lot of all reforms which aim to change customs that have been canonized by age. But in this case, the opposition has been singularly inconclusive. With but few exceptions, it has come from men to whom even the alphabet of hygiene is unknown. Sentiment has been invoked to

combat a reform founded in reason and approved by determinate experience. A limited number have sought to make earth-burial a test of Christianity, thus adding another to the many crimes that have been committed in her name. The Bishop of Lincoln, England, in 1874, during the dawn of the reform, evolved from his inner consciousness the surprising ex-cathedra statement "that a revival of cremation would destroy belief in a final resurrection!" He forgot, in his affirmation of faith, be it said, to answer Earl Shaftsbury's pertinent question: "What has become of the blessed martyrs?" I might add, Where are the innumerable, they, the Christian men, women, and little children, who have suffered death in conflagrations on land and sea? Is that inscrutable essence within man, the myself, the very life, which thinks and impels, loves and hates, and which we call the soul; is that really "of the earth, earthy" and is it positively annihilated when the cremated body gently fades away, "like the fabric of a vision, leaving no wrack behind"? If the soul of the martyr died when his body burned at the stake, what meaning is there in the liturgical averment: "The noble army of martyrs praise thee." That which has been annihilated can neither "praise" nor blame. The bishop's logic halts, and his rhetoric is cruelly faulty.

The only churchman in this country, so far as I remember, who has sought to emulate the unwisdom of his brother, the Bishop aforesaid, is Bishop A. Cleveland Coxe, of Western New York,—an able man, a cultured writer, and an author of repute, but who appears to look at this reform through the reverse end of his mental telescope. Ignoring a righteous verdict in which unite hundreds of fellow clergymen, thousands of scientists and scholarly laymen, and fully nine tenths of the educated medical men of the world, who have studied these things, which he has not: ignoring the overwhelming evidence accumulated and being accumulated against the sanitary and civil evils of earth-burial, the which he seems, likewise, disposed to consider a test of Christianity, he says: "Christian civilization substituted for the burning of beloved bodies, the gentle inhumation of the cemetery, in which they are laid asleep." He further asserts that "there has been no assemblage of thinkers to give the subject dispassionate consideration, those who are the first to be ignited by the craze being known as cranks." "Ignited" is good. "Craze" is better and "crank" is best, coming as they do from a Reverend Father in God, who at matins, when he intones the ninth commandment, is supposed to join his people in the response: "Lord have mercy upon us, and incline our hearts to keep this law." I must infer, however, that the act is in the Bishop's case, somewhat perfunctory, and is done with a mental reservation that relieves himself of the duty of obedience, to which the other unpriestly fellow is held and firmly bound.

Writing upon a topic involving momentous interests, it was his bounden duty, exhaustively to study the question in all its bearings to the end that as a stoled priest and a gentleman, he "might know whereof he

affirmed." Then, he would have learned that he was a tergivisator, one "most ignorant of what he was most assured;" who, as early as 1886, could assert that "*no* assemblage of thinkers had given this subject dispassionate consideration." Per contra, he would have found that several congresses, numerously attended by distinguished men, *had*, within the twelve years next preceding his *Forum* essay, been held in Europe; that very many cremation societies composed of men who, in scientific circles, had richly earned the right to be entitled thinkers, had for full ten years, been in active existence in Europe and America; that leading medical societies on both continents had formally approved the reform; that through the influence exerted upon public opinion by the cremation society of France —which was founded in 1880—a public crematory was erected in overcrowded Pere la Chaise cemetery, Paris, in 1886, the same year his philipic was printed. This handsome building, I may say in passing, has two incinerators, and an annual capacity of five thousand bodies. It was first used for the purpose to which it is dedicated, October 2, 1887. It has been in constant use since then, thousands of bodies having been cremated therein.

Such ignorance as Bishop Coxe—a consecrated teacher of men—displayed, was as disgraceful as his epithetical violation of the ninth commandment was criminal.

In the *Forum* for May, 1886, the Rev. J. W. Chadwick of Brooklyn, N. Y., replied effectively to Bishop Coxe, and thus dismissed him who had feebly attempted to

> "Prove his doctrine orthodox,
> By apostolic blows and knocks."

Said Chadwick in his summing up: "Those of us who believed in cremation before we read the Bishop's article, having read it carefully, believe in cremation certainly as much as ever, and perhaps a little more." Said the great teacher: "If the blind lead the blind, both shall fall into the ditch."

There, or *thereabouts*, the Bishop and his meager following were found after Chadwick's rejoinder.

Contrast Bishop Coxe's exhibition of misinformation with the thoughtful utterances of another prelate, the late Bishop of Manchester, of England. Some years ago, in a public address, he alluded to his recent consecration of a cemetery, and used these timely words: "Here is another hundred acres of land withdrawn from the food-producing area of this country forever. I feel that before long we shall have to face this problem—How to bury our dead out of our sight more practically than we have hitherto done. I hold that the earth was made, not for the dead, but for the living. Cemeteries are becoming not only a difficulty, an expense and inconvenience, but an actual danger."

This Bishop's humane utterances were "the outward visible sign of the inward spiritual grace" which had descended upon him from the Master

who examined before He condemned; who respected honest doubt, and welcomed the doubter, and who gave his followers to understand that "to break with prejudice and convention" was a condition precedent to right thinking when confronted by all reforms, especially by such as are not only hypothetical, but also demonstrable. The other Bishop, perhaps unconsciously, emulated Ovid, who said:

> "I see the right and I approve it too,
> Condemn the wrong, and yet the wrong pursue."

Since 1886, despite Bishop Coxe's anathema, this reform has spread rapidly among the clergy, very many of whom "have the courage of their convictions" and speak out. A notable instance of this fact recently appeared of record in the symposium on cremation published in the *Chicago Tribune*. The reporter interviewed such representative clergymen as Bishop Fallows, Jenkins Lloyd Jones, Dr. H. W. Thomas, John Rusk, H. A. Delano, and Thomas C. Hall. The result was a very positive and unanimous expression, adverse to the proposition that earth-burial *is* a test of Christianity; and an equally positive expression favorable to cremation as the most beautiful, the most speedy, and the only sanitary method of fulfilling the law: "Dust thou art, and unto dust shalt thou return."

In marked contrast to the opinions expressed by those Chicago clergymen who, in learning, piety, and good work, are the peers of the Hierarchy of Rome; one of the latter faith, Archbishop Ryan, of Pennsylvania, recently, as I learn from the *Urn*, "refused to permit funeral services to be held in his cathedral, over the body of a parishioner about to be cremated, because it is not a Christian burial under the Catholic ritual." So it seems that there are Christian burials and Christian burials, and of these latter those performed under the Catholic ritual are alone canonical! I believe it is one of the dogmas of that church that only he who dies in that faith can be interred in consecrated ground. Why then, could not this astute archbishop, for whom American popularity is claimed, because of his supposed tolerance, this scholar and man of affairs, who ought not to be ignorant of the sanitary aspects of this serious question; why should he not rise to the occasion and erect and consecrate crematories in his cemeteries, whose use should be optional, and thus solve the problem in favor of humanity, as it becometh one to solve it, who is a prince and ruler of vast influence in his church? History avers that the church in the middle ages favored cremation for opinion's sake. For a humanate, a more Christian purpose—that of the health and wealth of the peoples—why should it not do so now? It seems very strange to me that the church whose policy led it, in its stormy dawn, to adopt and rechristen so many Pagan holidays and customs, should have ignored cremation of the dead, the most gracious custom of all; one which is perfumed with mercy for the living and tenderness for the dead; and one which enforces in its every object lesson the comprehensive procla-

mation of the *Master*, "God is not the God of the *dead*, but of the *living*." I believe the church administers the sacrament of extreme unction only when it is supposed that the life drama of one of its children is in the last scene of the final act, death being at hand to ring down the curtain, and that this last rite is the *pour prendre congé* act of the priest, the Catholic ritual providing no special service for the final interment. These being facts, I fail to comprehend how cremation is unchristian according to the Catholic ritual, the extreme rite having been performed and the ashes of the dead having been inurned to await the resurrection. Certainly, the archbishop's decree is not considered to be the rule in Europe, where several thousand of his fellow-Catholics were cremated last year, without prelatic interference.

Curiously enough, two years ago, Grand Master Arnold, of the Masonic Grand Lodge of Pennsylvania, refused a subordinate lodge permission to perform the funeral service over the dead body of a brother about to be cremated. His objection was not that the act was unchristian, neither did he deny the right of a dying brother to dictate as to the disposal of his remains, as has been erroneously asserted, but his refusal was solely based on the proposition that the ritual of the Masonic burial service requires the mortuary scroll, the apron, and the emblem of faith and remembrance—the significant evergreen—to be dropped into the open grave with appropriate comment, and these things he says cannot be done "in a *furnace*!" He sums up with this statement: "A vault *is* a grave, a furnace is not." The lexicographers define the word "vault" more accurately. They call it a cave, a cavern, a cell, never a *grave*. He meant, I suppose, the familiar, above-ground monstrosity provided by cemetery authorities for the temporary care of the dead. If the Grand Master had ever visited the crematory in the city burial ground of Philadelphia, and had examined that edifice, and had there witnessed a cremation, as he should have done before he made his decision, he would perhaps have decided differently. He would have seen that the mortuary chapel is a sepulchre on a more magnificent scale, and one totally free of the charnel-house odors, and the repellant gloom of the regulation cemetery *vault*. He would also have learned that a crematory is not a *furnace* in the sense that the body is buried directly in the flames, and thus reduced to nothingness, which is the purpose of all forms of burial. On the contrary, he would have seen that the incurious corse is reverently placed in an inner sepulchre, hermetically sealed, around which the disinfecting fires fervently circulate, entering not the benignant tomb. There, saved from the worms and the menaceful pollution of a gloomy earth-grave, he would have seen the radiant mortal part serenely melt away "as the sunbeam drinketh dew." How could an intelligent Mason seriously assert that it is unmasonic to render funeral honors to a dead brother amid such surroundings as that chapel proffers? A few necessary verbal changes in the ritual could easily have been made, and the scroll, the

apron, and the evergreen, could have gone with the body into the incinerator. It was as Masonic to bury them there as to fling them into an open grave to *rot*. Let the ritual be changed to conform to the times. It is not immutable, like the sacraments of the church.

Pennsylvania conservatism cropped out in a concurrent decision of the Grand Master. The Master of a lodge refused to entertain a motion allowing the cinerary urn of a cremated brother to be placed in the lodge room. The District Deputy Grand Master affirmed the decision. Grand Master Arnold was appealed to and said: "A lodge room is a place for lodge labor and refreshment, and not a place of sepulture." As an old student of "the strange, mysterious, glorious science," and as one who has been a not undistinguished actor in their governing bodies, I cannot agree with Arnold. Given a fire-proof hall, owned by the craft, it seems to me that a room, appropriately arranged and decorated, might very properly be set apart and dedicated as a columbarium. In this, lodges of sorrow could statedly be held, and the memory and the achievements of departed worth could thus be kept alive as lessons for the living. Stranger things than this may happen within the next decade, so rapid is now the progress of this wholesome reform. It amuses me to observe Masonry in staid old Pennsylvania in temporary at-one-ment with the Romish church on this topic. Masonry, for generations, has been the *bete noire* of that far descended and splendid autocracy. The head of the church has often projected damnatory bulls at the institution at long range, and during occasional rests from this diversion the church has sat in "the cool shade of *orthodox* aristocracy," meditatively "biting its thumbs" at the craft, wondering, meanwhile, why these objugatory fusilades did not give the institution pause. These episodes amused their authors and did Masonry no harm, for the royal craft can only be "wounded in the house of its friends" and these wounds are generally unknown, as it is not permitted to "air them in the market place." So, the imperial institution, in conscious rectitude, went on its stately way "reviling not again," and utterly refusing to be annihilated. Now, *mirabile dictu*, the Church and Masonry—that is to say, quaint Pennsylvania Masonry—

> "In mutual, well-beseeming ranks
> March all one way."

The lion has lain down with (and outside of) the lamb, and a major sign of the millenium has appeared.

But it is safe to prophesy that while awaiting the coming of the Lord, an increasing number of Catholics—and certainly of Masons—will annually become converts to the wise doctrines of this salutary reform, which unselfishly seeks to eradicate costly evils that endanger the public health, and jeopardize human lives. So far as I am informed, after due inquiry, the hierarchs in Catholic countries of Europe have not directly and publicly condemned cremation. This benignant custom had its renascence in a Catholic country, and within the immediate shadow of the Vatican.

It is largely, very largely, in evidence there now among intelligent people, and its educational influence constantly widens. In other Catholic lands on the continent, it is favorably known of men as the sole solution of the problem of the disposal of the dead in the interests of the living, and is so proclaimed, unrefuted.

Cremation and earth-burial are one in purpose—that of resolving the dead body into its primal elements. But earth-burial does this by a slow process, which, as a rule, it takes many years to complete, and this process is one of such repulsiveness, and so full of peril to the living, that it is no marvel sanitarians should advocate incineration as the better, safer, quicker, and more humane method, forasmuch as it substitutes purity for impurity, beauty for loathsomeness, and at the same time traverses no church rites. Twelve years ago died a Past Grand Commander of Templars in Pennsylvania, Dr. Charles E. Blumenthal,

> "——— who bore without abuse
> The grand old name of *gentleman*,
> Defamed by every charlatan,
> And soiled with all ignoble use."

He was a man distinguished in medicine, in letters, and in Masonry. He had long been an outspoken advocate of cremation, and on his deathbed he directed that his body should thus be disposed of. His wishes were respected by his family, as is not always the case, and his remains were incinerated in the famous Le Moyne crematory, at Washington, in that state, October 16, 1883. No Masonic funeral service in his honor was performed. Noting that sin of omission the writer hereof, in a review of the doings of Templary in 1884, used this language: "An appropriate and beautiful Masonic service could easily be arranged for such occasions. If this ancient method of disposal of the mere shell in which lives *the* man should ever become universal, as it ought, for sanitary reasons especially, such a service will undoubtedly come into use." Eleven years later, after having actively engaged in the "reasonable service" of this beneficent reform, I can say: "The hour has come!"

In this connection I must refer to another phase of this semi-official Masonic opposition, which materialized some months since in Ohio. A *Cincinnati Enquirer* reporter interviewed several past grand officers and published their views of the merits of a decision of the successor of Grand Master Arnold, who recently duplicated the ruling of his predecessor, hereinbefore mentioned. The subject of this later decision, I am happy to say, had been a member of a lodge, whose Master and craft believed in lawful freedom of action, and their dead brother's body was honored by the usual Masonic funeral service in the crematory at Germantown, Pa., and was *then* cremated. One of the aforesaid Free Masons—all the others distinctly differing from him—vigorously opposed the reform. His contention was—that it is a *heathen* method. He said: "My observation is, that its advocates are generally free-thinking *foreign-*

ers (?), unbelievers in any kind of religion, except, perhaps, some fanatical fad of their own; generally nuisances in church, Masonry, and politics," with much more of the same sort of stuff which was quite characteristic of a robustious man who is habitually "intoxicated with the exuberance of his own verbosity;" as Beaconsfield, with undiplomatic frankness, and less truth, said of Gladstone.

The caustic editor of the *Urn* neatly disposes of the Ohio malcontent in the July number of that valuable journal. He forgot, however, in his adequate reply, to inform the party whom he was flaying, that cremation is no more a heathen custom than is earth-burial, both methods having been employed by pagan nations, side by side, for immemorial ages. So the supporters of earth-burial are really following a pagan custom, after all. Another Ohio past grand officer interviewed was Past Grand Master Goodale, who was unequivocally in favor of cremation as a sanitary necessity, and saw nothing unmasonic therein. This gentleman, but a little while before, had had occasion to define his position on the question: Does a Masonic brother desiring to be cremated after death, really lose his right to funeral honors? The case was this: A Scotch Rite Mason, a druggist in Cincinnati, died. He had expressed a wish that his body should be cremated. His family respected that wish, but desired that funeral honors should signalize the incineration. The Scottish Rite cathedral was asked for. The epithetical opposer aforesaid, has charge of that edifice and refused its use because cremation was to follow the service. The chapter room in the Masonic Temple was promptly tendered and accepted and Most Worshipful Brother Goodale—honor be to him—himself, with ample Masonic assistance, gave the dead brother his well-earned funeral due. Past Grand Master Goodale favors the proper changes in the funeral service to adapt it to cremation as well as to earth-burial.

Another distinguished past grand officer, who for many years was Grand Secretary of the Grand Lodge of Ohio, was also interviewed. This was the Honorable J. H. Bromwell, then, and now, a member of congress from the Cincinnati district. He, likewise, approves cremation for sanitary reasons and knows of no Masonic law prohibiting the signalization of a fraternal incineration with Masonic honors. Like Most Worshipful Brother Goodale, he favors rearranging the burial service for this purpose. I am heartily glad to welcome Congressman Bromwell and his associate to the augmenting army of friends of this momentous reform. He occupies a conspicuous public position, and being an able man, can render the cause efficient aid. His influence may be invoked on collateral phases of the question ere long, as, for example, in support of the pending, and yet unsettled, proposition to organize in our national government, a department of public health; one distinctively non-partisan, permanent, and adequately endowed with legal powers. as well as means wherewith to enforce them. The enactment of a law inviting the coöperation of European governments in an effort to induce "the unspeakable Turk" to suspend his

Armenian and other unchristian pastimes, and turn his immediate attention to the absolute necessities of sanitary reform in Mecca, from whence, more obtrusively than from the region of the Ganges, where the disease may be said to be endemic, cholera is brought to Egypt, Syria, and thence to Europe and America, by returning Moslem pilgrims. No more fruitful field than Mecca can be found for the exemplification of the saving virtue of the cremation of the dead from infectious disease. There, as we well know, evils exist, which Turkey should be compelled to eradicate because they affect the world at large. They are legitimate subjects for international intervention, for the law of nations denies the right of any one country to become a persistent propagator of deadly epidemics, which menace the peace and lives of other peoples. And again, the passage of an appropriation for the erection of crematories at all government quarantine stations, so wording the law as to make cremation of those dying there of zymotic disease obligatory upon the quarantine authorities.

Recently, during a conversation with that eminent statesman, the sagacious and courteous Senator Allison of Iowa, who, I think, is more nearly resemblant of Addison's characteristics, as pictured by Pope, in his charming Epistle V, than almost any other of our public men, I was greatly pleased to learn that observation and reflection have combined to cause him to recognize cremation of the dead as one of the most important and far-reaching of the sanitary questions of the time, and that, in his judgment, its general substitution for earth-burial would be a boon to the living.

Should the sovereign people, as is not improbable, sometime say to this cultured gentleman: "Well done, good and faithful servant,—come up higher," sanitary science would have a "friend at court," whose commanding influence might avail it much on occasion.

And so this grand reform pursues its majestic march, receiving new and valuable adherents to its disciplined, militant forces, day by day. The resurgent reform needs them, and welcomes them to its counsels. Those who come to us have courageously risen above prejudice and conventionality, and have come to stay and to do. It is not long since this revival passed its tentative stage, in its journey toward its ordained goal of accomplished fact. Its triumphs, during its hitherto career, have been many and conclusive. They are prophesies of greater victories in the future and I firmly believe that our children will live to see the earth-burial blot upon our civilization wiped off, and this ideal sanitary method of disposing of the dead become the rule instead of the exception, as now.

Finally, let us all "be doers of the word, and not hearers only, deceiving ourselves. For if any one is a hearer of the word and not a doer, he is like a man beholding his natural face in a mirror, for he beheld himself, and has gone away, and immediately he forgot what manner of man he was, but he who looked into the perfect law, the law of liberty, and remained thereby, being not a forgetful hearer, but a doer of work, this man shall be happy in his doing."

DISINFECTION IN AMERICAN CITIES.

By CHARLES V. CHAPIN, M. D., Providence, R. I.

Being much dissatisfied with the methods of disinfection that I have hitherto employed I recently made a series of enquiries in regard to disinfection in other cities, and I thought that perhaps the result, of my investigation might be interesting to you, as they certainly were to me. I received replies to my enquiries from Toronto and Quebec, and from all but three of the 50 principal cities of the United States and from several others, making in all 57 cities containing an urban population of not far from 12,000,000. On the next page is a tabular statement of the answers received.

DISINFECTION IN AMERICAN CITIES.

The subject under consideration is disinfection after contagious diseases and the diseases particularly referred to are small-pox, scarlet fever, diphtheria, phthisis, and measles. I find that very different measures are taken in these diseases. Only two cities, Rochester and Toledo, disinfect regularly after measles, and a very few others do it occasionally or on request.

A great deal has been said and written in regard to measures that should be taken looking towards the prevention of the spread of phthisis. One might reasonably consider disinfection as an important means to this end, but only nine cities report that this is habitually employed after death from this disease. Some other cities report that it is done by request, but I should judge not very frequently. Of the nine cities just mentioned only three, viz., New York, Brooklyn, and Philadelphia, appear to employ effective methods. Of the other cities Detroit, Newark, and Denver rely on sulphur fumigation, while St. Louis makes use of steam disinfection, and Rochester washes with bichloride of mercury and does not use sulphur dioxid and has no steam disinfecting plant. In New York and Philadelphia the rooms where phthisis patients have died are fumigated with sulphur and the contents which can be subjected to steam heat, are so treated and other articles in the room are either washed or sprayed with an effective disinfectant. The same is done in Brooklyn with the exception of the fumigation. In New York this disinfection is only done by the employés of the city in certain cases, as hotels and apartment houses, and in others it is left to the supervision of the attending physician, in which cases I doubt not it is imperfectly done.

To fulfill the most modern requirements in this disease it is necessary:

1. That disinfection should be done after every death.
2. That it should be done by employés of the city.

3. That the room and its contents which can be so treated should be washed with bichloride of mercury or some similar substance, and that all other things should be steamed or burned.

It is seen that not more than one or two municipalities at present meet these requirements.

CITIES.	SO_2 Fumigation.	Steam Disinfection.	Washing with $HgCl_2$.	Disinfection Required by Law.	Disinfection done by City.	Disinfection in Phthisis.	CITIES.	SO_2 Fumigation.	Steam Disinfection.	Washing with $HgCl_2$.	Disinfection Required by Law.	Disinfection done by City.	Disinfection in Phthisis.
New York	+	+	+	+	*	+	Worcester	+	0	0	+	+	0
Chicago	+	+	+	0	+	*	Toledo	+	0	0	+	+	0
Philadelphia	+	+	+	+	+	+	Richmond	+	0	+	0	+	0
Brooklyn	+	+	+	+	+	+	New Haven	+	0	+	0	*	0
St. Louis	Cl.	0	0	+	+	+	Paterson	+	0	0			0
Boston	+	+	+	+	0		Lowell	+	0	0	0	+	0
Baltimore	+	0	+	0	+	0	Nashville	+	0	0	+	+	0
San Francisco	Cl.	0	0	+	*	*	Scranton	+	0	+			
Cincinnati	+	0	0	+	+	0	Fall River	+	0	0	+	+	0
Cleveland	+	0	+	+	+	0	Cambridge	+	+	0	+	+	0
Buffalo	+	*	+	+	*	0	Atlanta	+	0	+	+	+	0
New Orleans	+	0	+	0	+	0	Memphis	+	0	+	+	+	0
Pittsburgh	0	0	0	0	0	0	Wilmington	0	0	0	0	0	0
Washington	+	+	+	+	+	0	Dayton	+	0	0	+	0	0
Detroit	+	0	0	+	+	+	Troy	+	0	0	0	0	0
Milwaukee	+	+	0		+	0	Grand Rapids	+	0	+	+	*	0
Newark	+	0	0	+	+	+	Reading	+	0	Carb.	+	+	0
Minneapolis	+	0	0	+	+	*	Camden	+	0	0	+	+	0
Jersey City	+	0	0	+	*	0	Trenton	+	0	+	0	+	0
Omaha	+	0	0	+	0	0	Hartford	Cl.	0	H_2O	+	+	0
Rochester	0	0	+	0	+	+	Salt Lake City	+	0	+	+	+	0
St. Paul	+	0	+	+	*	0	Salem	+	0	0	+	+	0
Kansas City	+	0	0	+	+	0	Charleston	+	+		+	+	*
Providence	+	+	0	+	+	0	Los Angeles	+	0	Carb.			0
Denver	+	0	+		+	+	Lawrence	+	0	0	+	+	0
Indianapolis	+	0	+	+	*	0	Augusta, Ga	+	0	0	+	+	0
Albany	Cl.	0	0	+	+	0	Toronto	0	+	+	+	+	+
Columbus		0	+	+	*	0	Quebec	+	+	+	+	+	+
Syracuse	+	0	0	+	+	0							

+ signifies that the method referred to is practised in the city named.
0 signifies that the method referred to is not practised in the city named.
* signifies that the method referred to is occasionally practised in the city named.

Of all diseases small-pox receives the most efficient treatment at the hands of public disinfectors. It is probable that this disease does not cause more than one hundredth part as many deaths as do scarlet fever and diphtheria, yet it receives far more active treatment. It is not that health

officials do not appreciate the far greater importance of these latter diseases in swelling the current death-rate, but they realize that at present public opinion will not permit their taking as active measures against them as against small-pox. There is probably scarcely a city or town in which pretty fair disinfection would not be attempted after cases of this latter disease.

Many of the cities from which I received replies to my enquiries stated that great care was taken in this disease, while in other diseases disinfection was comparatively neglected or performed in an inefficient manner. Thus Albany, Buffalo, Cincinnati, Cleveland, Grand Rapids, Nashville, St. Louis, Trenton, and Troy report that infected articles are burned, and I have no doubt that this practice is followed in many other places. A number of other letters state that washing rooms and clothing, etc., with disinfectant solutions is very thoroughly done in small-pox, while it is not in other diseases, and some cities have a steam plant which is used in cases of this disease but in no other. In almost all cities the infected premises are fumigated.

The great bulk of the cases of contagious disease which receive active treatment at the hands of health officials are scarlet fever and diphtheria.

Almost every city which pretends to do any disinfection at all, makes use of some method of fumigation. Of the fifty-seven cities from which replies were received fifty-two report that sulphur dioxid is used for the purpose of disinfecting rooms and their contents. Four cities, St. Louis, San Francisco, Albany, and Hartford, use chlorine gas. The only cities which report that gaseous disinfection is not attempted at all are Rochester and Toronto. The old-fashioned sulphur fumigation is therefore more commonly used than any other method of disinfection after contagious diseases in American cities. Some few cities which formerly relied upon it in all cases have partially discarded it, as has Brooklyn in diphtheria. Many cities report that steam is generated at the same time that the sulphur is burned, in accordance with the recommendations of the committee of the association. But my experience is that if this is well done the colors of textile fabrics are liable to be affected.

Of the fifty-seven cities considered in this paper twelve are provided with steam disinfecting apparatus. No special enquiry was made in regard to the character of the steam apparatus employed, and so far as complete disinfection is concerned it is doubtful if it makes much difference. If only live steam is employed and the goods are exposed long enough, disinfection will be accomplished. But the form of apparatus and the manner of using it does make considerable difference in the effect on the goods that are treated. A jacketed cylinder in which the steam in the jacket is kept at a higher pressure than that applied to the goods is doubtless the best form. It is also an advantage to produce a partial vacuum before admitting the steam, and to dry out the goods with a current of hot air before the cylinder is opened. I do not know that all

these conditions are met in any single municipal plant in this country, and certainly the most common form of disinfector is a plain, unjacketed cylinder. Chicago, Milwaukee, and New York have a portable apparatus, but the latter city finds it inconvenient.

There is great diversity in the way in which the infected goods are handled. In some cities the disinfecting cylinder runs through a partition separating the receiving from the distributing room, and the infected goods are brought in one van by one set of employés and put into the cylinder at one end, and after they have been steamed they are removed from the other end of the cylinder by another set of employés and distributed in another van used only for this purpose. This is the ideal method, and can be and is employed by the largest cities. But for smaller towns it is too expensive, and I think practical experience has shown that by proper care it can be done in a more economical manner. If the goods are removed in bags and the employés wear suits of overalls and the bags and overalls are put into the disinfector along with the goods and the transporting wagon is disinfected each time, I do not think that there is any practical danger of infection. The use of canvas bags, or in some cities, of sheets, is now the usual method of carrying infected goods. I believe that it was first adopted in my own city in 1888.

When with the development of bacteriology doubt began to be cast upon the efficiency of sulphur fumigation and it was shown that at the best it could not always be relied upon attention was turned to the disinfection of walls, woodwork, furniture, etc., by the direct application of liquid disinfectants. This method of disinfecting was urged by the Imperial Board of Health in Germany and was soon employed quite generally there, and also in Paris. But the impetus to its practice in America was given largely by the efforts of the Louisiana Board of Health in their disinfection of vessels by a thorough application of a solution of bichloride of mercury. It is now generally acknowledged that the best means we have at present of disinfecting a room and such of its contents as cannot be steamed, is to wash or spray with some strong disinfectant solution. The officials of twenty-seven cities reported that it is their custom to employ this method. In the majority of these the rule in regard to this is more in the nature of advice than of law. It is left to the householder to do the work, and the supervision is left to the attending physician. We all know how futile any such method is. The only way to secure this kind of disinfection is to have the washing and spraying done by employés of the health department. Thirty cities report that their disinfection is as a rule done by men employed by the city, and a few others state that it is done in this way for the poor and in semi-public places like hotels and apartment houses. Only about a dozen of those who disinfect at public expense make use of this method of washing the room with a disinfectant. And if the reports from these cities be carefully examined with reference to number of men employed, expense incurred, and premises fumigated, it

will be seen that not more than half that number of cities in the United States and Canada really apply this method of disinfection in a proper and thorough manner. Thirty-eight cities report that they have laws requiring disinfection in all cases of scarlet fever, diphtheria, and smallpox, and most of these claim that the law is well enforced so far as applying the routine disinfection there in vogue.

From a consideration of disinfection as it *is* practised let us pass to the question of how it *should be* practised. And first let us ask how great is the need of disinfection, and what should be disinfected? In a general way we know that apartments are liable to become infected with the poison of the more common contagious diseases. A considerable number of instances have been reported where well persons have undoubtedly been infected by entering or living in such houses. But what we need is accurate information on this point. The liability of infection should be expressed numerically, we should know in what proportion of cases infected rooms are liable to impart their infection to their occupants. I am inclined to think it less than is commonly supposed. Unless such data are at hand, derived from a very large number of cases, it is impossible to determine clinically the value of any method of disinfection. The statistical method is the only method of clinically determining the value of disinfection, and to apply this we must know just in what proportion of *infected* rooms the disease is liable to develop, and second, in what proportion of *disinfected* rooms does the disease develop. In asking for such information I failed to get a single satisfactory reply. A number of health officers stated that the given disease seldom or never appeared after disinfection, but statistics or exact statement of facts were wanting. There should be kept an accurate record of every dwelling or apartment in which contagious diseases occur, the data of inspection of each case, and facts relating to isolation and disinfection. Such data should be tabulated and published and by comparing those cases where there is no disinfection with those in which there is fumigation, spraying, washing, steaming, etc., some reasonably certain conclusion might be arrived at concerning the value of methods or of no method.

Meanwhile I should bar out all so-called evidence deduced from the failure of infected rooms and clothing to cause the disease after disinfection, because we have no evidence to show how frequently they would have produced it if disinfection had not been done. The accompanying blank shows the manner in which this record is kept in Providence.

SCARLET FEVER.

Names of Children in House.	Previous Attack.	Age.	Date of Attack.	School and Work.	Parish.	Date of Removal.	Date of Return.	Disinfection.
								Isolation.
								Visits.
								Permits.

While the above appears to be the best test of disinfection we have other methods, laboratory methods, which can tell us much. Most of our disinfection is done for scarlet fever, diphtheria, and small-pox. Fortunately we know the nature of the virus of diphtheria. It is a non-spore forming bacillus. We do not know the nature of small-pox virus, but it is reasonable to suppose that it is much like vaccine virus, and this we know behaves towards the common disinfectants much as do non-spore forming organisms. We know nothing about the nature of the scarlet-fever poison. But certainly one would be rash to affirm that it is any more easily destroyed than those just mentioned. We must look then for something which will at least destroy non-spore-forming bacteria. Experiments have shown that it is possible in tight apartments by twenty-four hours' treatment, when freely exposed in very small masses, to destroy spore-free organisms by sulphur dioxid or chlorine gas. But further experiments in rooms as they are usually constructed, and with the organisms exposed in somewhat protected positions, as the virus of disease must often be, this cannot be relied upon; the organism often survives. The direct application of mercuric bichloride in the strength of 1-1000 has been shown to be effective if the surface is reasonably clean and the liquid used is not allowed to get dirty. It is thought by many that the addition of five per cent. of carbolic acid is a great improvement, as this is not decomposed by the albuminoid substances with which it comes in contact. A spray also has advantages if care is used to reach all infected surfaces, for by this means a clean solution is always applied. This method has been much employed in Paris, but the only city in the United States

that I know makes use of it is Philadelphia. Steam heat has also been shown to be effective not only with spore-free bacteria but also with the spores themselves. These two methods then, washing and steaming, we may reasonably consider effective.

We must also bear in mind the necessity for isolation as a preparation for disinfection. If the sick person or even the nurse of the sick person is permitted to run all over the house and handle everything, there will be a large number of articles infected which it is impossible to disinfect. Shoes, gloves, leather-covered books, fancy articles, upholstered furniture, cheaply gilded metal work, and a thousand and one things which will be found in the houses of persons in even moderate circumstances, are injured by any effective disinfection. And then, too, the infection often takes place before the disease is recognized. This general infection of the whole house is to my mind one of the greatest practical difficulties we have to contend with. It should also be remembered that it is useless to disinfect the house and its contents and leave out the patient. It is necessary to see that the patient is disinfected or free from contagion.

The conclusions to which I wish to call your attention are:

1. That our first need is more accurate statistics on which can be based conclusions in regard to the relative efficiency of different methods of disinfection.

2. The unwisdom of relying on the disinfection of rooms with sulphur dioxid.

3. The best methods we know of at present are the washing of the room and so much of its contents as can be so treated with strong liquid disinfectants and the treatment with steam of articles that can be steamed.

4. Things that cannot be treated by either process must be burned.

5. The municipality should at its own expense conduct these operations.

6. Disinfection without a fair degree of isolation is in most cases impracticable.

DISCUSSION.

Dr. Henry Mitchell, of Asbury Park, N. J.—I would like to ask Dr. Chapin if he has made any investigations in regard to the germicidal power of naphtha, and whether or not the dipping of books, which are known to be infected, in this fluid will render them harmless?

Dr. Chapin.—I did make a few experiments in regard to it, but they were not satisfactory. I thought at first that we could use it as a germicide, but after pursuing my investigations further, I came to the conclusion that it could not be so used. I tried treating books in this way, and I find it is difficult to dry them out. It takes a long time to do it. Whether naphtha can be relied on as a germicide I do not know. I think the health officer of the city of Cincinnati has made some extended experiments in regard to it.

Dr. Swarts, of Providence, R. I.—I would ask Dr. Chapin whether he has disinfected living apartments by the use of steam, and if so, what the results were?

Dr. Chapin.—I have experimented with steam in disinfecting an ordinary living room. It took all the paper off the walls, and the furniture, which was moderate priced furniture, dropped to pieces. I have little doubt it was thoroughly disinfected. There was no human occupant in it at the time.

MUNICIPAL STEAM DISINFECTION.

By H. B. HORLBECK, M. D., Charleston, S. C.

For the past decade the general government and a number of cities on the seaboard have exhausted scientific development in procuring the means and methods of protecting the general country, and the special cities interested, against the introduction of contagious disease from foreign shores, by the aid of steam disinfection. The results show what an immense amount of good has been done, and the chain against cholera and yellow fever has been slowly and surely welded, and the links made stronger and more binding. Our success has been so great that attention is now being directed to using steam disinfection for the protection of our cities and municipalities against infection from dangerous sources prevailing among the people of these cities and municipalities.

Whilst fumigation and disinfectants have been for many years freely and generously used and supplied, there is a necessity always present for the use of steam, as a powerful adjuvant in our batteries, for the prevention of the life and continuance of dangerous bacteria. These disease germs are so surely and constantly present—some one among them—that it has become imperative that the means and appliances should be always present, and ready to be afforded, in all and every case, for the use of steam for the destruction of the bacteria which may be threatening the public health. There should not be a community of ten thousand people in the United States that is not supplied with a properly constructed steam cylinder, where all articles of clothing, household hangings, carpets, bedding, etc., might be sent, to have all dangerous microbes destroyed.

In approaching this subject in the city of Charleston, several years since, the writer was very much disheartened at the cost of the appliances offered for sale in France, and to be procured in this country. Not only the cost of these appliances, but the added maintenance, rendered the obtaining of one of them in a small community, almost prohibitory. Among the many interests requiring such service, it occurred to us that the city hospital was almost always in want of such a system for the destruction of bacteria in polluted clothing, etc. A very large proportion of the patients of the city hospital of Charleston are taken from the colored race, and their clothing, as a rule, will require to be submitted to steam infection. Besides, there is constantly a requirement in every hospital, that polluted sheets, bedding, mattresses, etc., before going into the laundry, should be placed in the steam cylinder for purification. It is therefore most apparent that a general hospital is deeply interested in having in service a steam disinfecting plant. It also occurred to us that after such a plant was erected the maintenance of it was a matter of con-

siderable outlay, and to avoid these expenditures the idea was put into execution of obtaining the steam supply from the hospital laundry boilers.

I have had a blue print made of the plan of our steam cylinder, and herewith present the specifications. The engineer in charge of the boilers of the laundry, for a small addition to his monthly pay, undertakes to give all the attention necessary. With this paper I present the rules and regulations in force for the reception and care of all infected articles sent to the cylinder for disinfection.

This simple jacketed, steel plate chamber, with pop valves, and every protection required, with thermometers, etc., placed in a house with solid concrete floor, cost about $1,000 complete, and the maintenance costs but a trifle a year. Surely it would seem that where so small a sum is required to afford so great a means of protection, every community should use their utmost endeavor to obtain a cylinder for the protection of the public health against dangerous bacteria.

Doubtless you have all thought of this matter, and doubtless many of you are provided with such appliances. Our reason for bringing this plant to your attention is the perfect character of the cylinder, which in less than ten minutes affords 230 degrees of heat, Fahr., the small cost of the plant, and the ease and certainty with which the plant is operated. From start to finish thirty minutes is required. Our experiments at our quarantine station (*vide* Transactions meeting A. P. H. A., 1892, city of Mexico) showed that the bacillus typh abdom-coli communis, Indicus, and hog cholera, wrapped and tied up in six or eight folds of woollen blanket were killed on being subjected to 230 degrees Fahr. moist heat. With such a test we have felt that at a most moderate outlay, the means of easy destruction of bacteria and their spores was always available. This cylinder has been in constant use for the past year, for diphtheria, scarlet fever, typhoid fever, and consumption.

On the termination of a case of contagious disease, an officer is ordered to go to the house, taking with him large sheets. The articles to be disinfected are tied up in these sheets, and carried in a covered wagon to the cylinder, and the sheets and articles are introduced into the cylinder for fifteen minutes—230 degrees Fahr. Meanwhile the wagon is thoroughly disinfected with sulphur dioxide fumes.

Our conclusions are that almost every city possesses, in some form, a boiler from which steam is available at a minimum cost; that a cylinder and house to contain the same, can be obtained at a cost of $1,000, and that diphtheria, scarlet fever, etc., can be diminished at a very moderate cost and outlay.

CITY OF CHARLESTON, S. C.

DEPARTMENT OF HEALTH,
OCTOBER 15, 1894.

RULES FOR THE USE OF THE STERILIZING CYLINDER AT THE CITY HOSPITAL.

1. Whenever the cylinder is required for use a notice must be sent to the health officer.

2. The health officer will at once direct the health detective to call at the premises indicated, and give instructions as to gathering together the articles of clothing and bedding, etc., required to be sterilized, and carry with him the proper sheets to secure the same.

3. He will, under instructions from the health officer, call for the articles to be disinfected, accompany them to the cylinder, and place them in the cylinder for disinfection.

4. The health detective, under instructions, will, whenever the cylinder is wanted, notify the engineer at the City Hospital to be in readiness at a convenient hour as soon after notice is given of the required use of the cylinder as is possible.

5. The engineer will at once, on notification from the health detective, make arrangements and have a supply of steam at a time agreed upon by the health detective and himself ready for use.

6. Immediately as the articles are taken out of the ambulance, the health detective will place in the ambulance two pounds of sulphur, set the same on fire in a proper iron pot (pot to be in a pan containing two inches of water), closely securing the vehicle in front and rear to keep in the fumes.

7. The clothing, etc., must be subjected to a temperature of 230 degrees Fahrenheit steam heat for not less than fifteen nor more than twenty minutes.

8. The clothing must then be collected and replaced in the sheets.

9. The sheets used for bringing the articles must on every occasion, without fail, be placed in the cylinder at the same time with the infected clothing.

10. After proper sterilization, the health detective is charged with personally returning the articles entrusted to him, and he is held responsible for all articles sent for disinfection.

HALL T. MCGEE, *Chairman of Committee.*

H. B. HORLBECK, M. D., *Health Officer.*

DESCRIPTION OF STEAM DISINFECTING CHAMBER AT CITY HOSPITAL.

DESIGNED BY VALK & MURDOCH IRON WORKS.

This chamber is made of two steel cylinders, the outside, or jacket, cylinder measuring 54 inches in diameter, and the inner cylinder 48 inches in diameter by 9 feet long, forming a steam space of 2 inches between them, properly braced with screw stays for a pressure of 100 pounds. One end is closed with a thick dished head securely riveted in the same; the other end has a removable dished head, secured by hinged bolts. There are four angle iron brackets, two on each side, in the interior cylinder, extending the full length, on which rest two wooden racks covered with galvanized wire netting. These racks slide in and out for receiving the bedding, clothing, etc., to be disinfected.

A steam pipe passes through the bottom to inner cylinder, with T connections, and a perforated pipe from either end extends from this T near ends of cylinder, the perforations being on bottom of pipes, to admit live steam into chamber. There is also a steam pipe on bottom, connecting with outer jacket. Two pop valves on top connect one each with jacket and inner chamber, the latter set to pop at ten pounds pressure. On top, at rear end, is tapped a hole where a thermometer is

inserted for obtaining the temperature of chamber. The whole jacket, as are also the steam pipes, is covered with magnesia covering to retain the heat, and avoid condensation.

On the side of the cylinder is placed a steam exhauster, for exhausting air from inner chamber. In operation, the cylinder being opened at end, steam is admitted to the jacket at 60 to 100 pounds pressure. The articles to be disinfected are then placed on racks, and slid into chamber, the head closed and secured. The exhauster is then opened, and a vacuum of 14 inches obtained in a few seconds. When a dry temperature of 180° is registered in chamber, live steam is turned into same. When a temperature of 230° is reached, the exhauster is again opened, to remove pressure and vapor only, and the head removed, completing the operation. An overhead track and trolley are provided for convenience in handling the removable head, from which the head is suspended, and pushed to one side when charging.

SPECIFICATIONS FOR STEAM DISINFECTING CYLINDER, AND SHED

To be Erected on Grounds of the City Hospital, at Charleston, S. C.

Foundation. Excavation 18 inches deep, furnish all material, and lay concrete base of dimensions as shown in drawing, for brick walls 18 inches wide by 6 inches thick, of one part Portland, three parts gravel, three parts broken brick or stone, latter not over 1½ inch cubes. Same to be well rammed and levelled on top.

Furnish and lay brick walls 8 inches thick (one brick) by 24 inches high; bricks laid with good cement mortar; top of wall to be 12 inches above the general level of ground; also furnish and set in each side wall two ¾ inch rods and cast washers, washers to be bedded under concrete, and rods extending high enough to pass through sills, with plate washers, and nuts for securing same to foundation.

Building. Furnish all material, and erect frame shed in accordance with drawing. Corner, door, and window posts to be mortised and tenoned. All studs and posts dressed on one side, to make faces in line; all weather boards and roofing boards dressed on one side. Roof joists dressed three sides, and projecting to support cornice. A neat cornice to be fitted around roof, as shown on drawing. Entire roof and front cornice to be covered with M. E. tin, securely nailed, and guaranteed tight for one year.

Ventilator. One 12 inch globe ventilator, fitted in roof as shown. Sides, front, and back, inside of shed, to be covered with half-inch dressed G. and T. boards, put on diagonally, and securely blind nailed to each stud.

Windows. Three windows fitted in sides and back of shed; neat frames, sashes 1¼ inches thick; twelve lights, 10 by 14 inches; all neatly finished.

DOOR. One double panel door, fitted with butt hinges, bolts, neat lock and porcelain knobs; also hooks to secure doors when open.

There will be one brick step, covered with Portland cement, at door, 12 inches wide by 8 inches high, full width of door.

FLOOR. Furnish all material, and lay concrete floor not less than 4 inches thick, of same material as concrete base, on earth filling, well rammed, and cover same with cement 1 inch thick, floated to make a smooth, even surface. Floor, when finished, to be 1 inch high in centre, with gutters formed each side, and across the back of shed, with fall towards back end and north-west corner, discharging through 3 inch tile under sill (top of floor, when finished, to be ½ inch below the top of sill—not level with top of sill, as shown on drawing).

PAINT. Entire inside and outside of building, including doors, windows, sashes, and roof, to be painted in two coats of color approved by the board of health. Roof painted with Prince's metallic paint.

The contractor is to complete the building in a workmanlike manner, in accordance with the plans and specifications, and to the entire satisfaction of the board of health.

MACHINERY.

CYLINDER. One double walled cylinder, made of ¼ inch flange steel plate, 55,000 pounds tensile strength, 56% ductility, and 25% elongation, stamped with maker's name, each plate to be tested and guaranteed by maker, and certificate of tests to be furnished to the board of health; heads to be of the same material; inside of cylinder to be 48 inches in diameter, with 2 inch space between inner and outer shells, securely riveted with ⅝ inch burden rivets.

RINGS. Cast iron ring at back end, and flanged ring for front end; also cast iron ring securely riveted to one head, with slots for bolts.

BOLTS. Head on cylinder to have nineteen eye-bolts, fitted into jaws, with pins for holding same; screwed socket bolts to be fitted in cylinder, 7 inch centre, ¾ inch diameter, with ends upset; heads to be curved to a radius of 47 inches to 48 inches.

OVERHEAD—TRACK. One over-head track with hangers, trolly and supporting rod, with swivel and eye for supporting head.

Two cast iron brackets for supporting cylinder; two angle iron pieces each side of cylinder, to form rest for shelves; same fitted with rollers; two shelves made of cypress, and covered with galvanized iron wire, all as shown in detail drawing.

FITTINGS—EXHAUSTER—THERMOMETER. *All flanges, pipes, valves, fittings, complete*, including one exhauster, steam and vacuum gauges, pop valves, and one thermometer, with steam pipe to connect with boiler, to be furnished by contractor.

ERECTION. The steam cylinder, with track and fittings, to be set up in

shed at hospital, and connections to be made with boiler, ready for operation.

INSULATING—COVERING. Furnish and cover the cylinder with magnesia sectional covering, and cover over the same with canvas; all steam pipes to be covered with magnesia removable covering.

Contractor to furnish and erect the entire machinery as per plans and specifications, and to the entire satisfaction of the board of health.

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THE OUTLOOK FOR A GENERAL SYSTEM OF REGISTRATION OF VITAL STATISTICS IN THE UNITED STATES.

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Nearly twenty years ago, at the fifth annual meeting of this Association, held at Chicago, in 1877, the lamented Dr. Elisha Harris, of New York, in the course of a "Report on Plans for Complete and Authentic Records of Deaths and the Causes of Deaths in the United States," remarked,—"Before the national census of 1880 is commenced, all of the states ought to have a good system of vital statistics organized and in harmonious operation, contributing comparable and numerically complete results. If this were the case, the last two decades in the present century would have such records of the population as will be most needed by the public economist and all students of human welfare in our country. The United States government might promote and help perfect the inter-state system of vital statistics by organizing model examples of such a system in the army and navy and in all territorial governments. . . . Another decade of neglect to adopt an effectual system of registration in the United States would be greatly to the discredit of the intelligence and public spirit of American citizens."

The decade to which Dr. Harris looked forward with such hopeful anticipation has passed away, and we have reached the latter half of the following one. It seems well to pause for a moment in order to mark the more salient points in the history of vital statistics in the United States during the past fifteen years, to examine some of the causes that have prevented the realization of a general system of registration in this country as yet, and to note such signs of progress toward the ultimate accomplishment of this noble and useful end as may present themselves.

In the remarks that follow, I shall confine myself entirely to the subject of the registration of deaths. The complete registration of births is

a very difficult matter, and is secondary in practical importance to the accurate registration of deaths. The registration of marriages (and divorces) depends on quite different principles from the registration of births and deaths, and is much less subject to certain retarding conditions that affect the latter. Thus, in Michigan we have had a perfectly satisfactory registration of marriages since 1887, in which year a compulsory marriage-license law went into effect; and the statistics show that the returns of marriages were fairly correct even before that date.

DEATH RATES ACCORDING TO REGISTRATION RETURNS.

The diagram that accompanies the following table shows at a glance the general condition of mortality registration in this country for the years 1880–'93, inclusive. The state systems of registration of deaths are seen to divide themselves into two well-marked groups, namely, the group of states having fairly accurate registration, and the group of states having imperfect registration. The returns of the latter range from about 10 to 80 per cent. of the deaths that probably occurred. Of course it cannot be known what the exact proportion of deficiency is in any case of defective registration, but from our general knowledge of mortality statistics and the probable rate of mortality in communities with similar age and sex distribution, we may be sure that our estimates of the deficiencies of registration in certain states are within reasonable limits. For the sake of clearness, the diagram does not contain all of the states referred to in the table, but only the more important and characteristic ones are represented. Also, for convenient comparison, the death rates of certain European countries, and, of especial interest to all students of the progress of the Anglo-Saxon race in different climes, the mortality rates of the Canadian province of Ontario and the Australian colony of New South Wales, are shown.

DEATH-RATES PER 1,000 LIVING POPULATION.

COUNTRIES AND STATES.	1880	1881	1882	1883	1884	1885	1886	1887	1888	1889	1890	1891	1892	1893
Austria	**29.8**	30.6	30.8	30.1	29 4	30.1	29.4	28.9	29.2	27.3	**29.4**	27.9	28.8	.....
France	22.8	**22.0**	22.2	22.2	22.2	21.9	**22.5**	22.0	21.8	20.5	22.6	**22.6**	22.6	.....
Germany	**26.0**	25.5	25.7	25.9	26.0	**25.7**	26.2	24.2	23.7	23.7	**24.4**	23.4	24.1	24.6
Italy	30.8	**27.6**	27.5	27.5	26.9	27.0	28.7	28.0	27.6	25.6	26.4	**26.2**	26.3	25.3
United Kingdom	20.4	**18.7**	19.3	19.6	19.4	19.1	19.2	19.0	18.1	18.1	19.4	**20.0**	19.0	19.1
New South Wales	15.5	**15.1**	16.1	14.6	16.1	16.5	15.1	13.4	13.9	13.9	12.9	**14.2**	12.2	.....
Canada	.....	**14.7**	.....	.....	.....	.....	.....	.....	.....	.....	.....	**14.1**	.....	.....
Ontario	10.4	**11.8**	11.2	10.7	10.9	11.0	11.4	11.5	11.5	11.2	11.4	**10.2**	10.8	10.6
United States	**15.1**	.....	.....	.....	.....	.....	.....	.....	.....	.....	**14.0**	.....	.....	.....
Alabama	.....	.....	.....	4.4	5.8	.....	.....	5.5	5.3	6.7	**6.4**	5.3	5.0	5.3
California	**6.7**	6.9	8.2	7.4	.....	7.7	8.8	9.0	10.5	9.2	**10.4**	11.1	11.9	9.6
Connecticut	**16.2**	16.6	17.4	17.5	16.2	17.0	16.1	17.5	18.0	17.1	**18.3**	19.0	19.5	19.0
Delaware	.....	.....	.....	13.1	9.2	.....	.....	.....	.....	.....	**17.0**	14.3	.....	.....
District of Columbia	**23.7**	22.6	24.2	22.3	24.1	25.0	22.8	22.2	22.4	20.6	**22.3**	22.9	23.4	22.6
Florida	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5.9	7.5	7.3
Illinois	.....	9.9	7.4	6.8	7.0	7.5	9.1	.....	.....	.....	.....	.....	.....	.....
Indiana	.....	.....	5.6	7.3	7.1	7.5	6.8	7.6	8.0	6.8	**6.8**	7.1	7.6	7.1
Iowa	.....	6.5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Kansas	.....	.....	.....	.....	.....	.....	**1.4**	**2.0**	**2.7**	**2.1**	**1.7**	**3.0**	**6.5**	**5.1**
Maine	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	18.4	.....
Massachusetts	**19.8**	20.1	19.9	20.1	19.4	**19.6**	18.6	19.9	19.9	19.2	**19.4**	19.6	20.6	20 1
Michigan	**9.4**	11.0	9.0	9.0	9.4	8.4	9.0	9.5	10.2	9.3	**9.7**	9 8	9.5	9.5
Minnesota	.....	.....	.....	.....	.....	.....	.....	10.5	11.6	11.2	**10.6**	10.5	10.1	10.1
New Hampshire	.....	.....	.....	15.1	16.8	16.7	17.2	17.1	18.0	17.3	**19.0**	18.7	20.4	.....
New Jersey	**16.8**	17.9	21.8	19.1	17.4	**18.6**	17.3	18.1	19.7	18.8	**19.8**	19.5	21.6	19.8
New York	.....	.....	.....	.....	.....	.....	.....	16.8	18.9	18.6	**19.5**	21.0	21.4	20.6
Ohio	**10.0**	10.3	8.8	8.8	10.5	9.7	8.7	10.6	8.6	8.7	**10.9**	11.9	10.1	10.4
Rhode Island	**17.5**	18.1	18.4	19.1	16.9	**17.7**	18.8	19.9	20.4	19.0	**20.1**	18.6	20.1	19.6
Vermont	**15.1**	16.0	15.8	15.0	15.2	15.6	14.6	15.9	16.8	15.9	**16.0**	16.2	17.9	16.1
Washington	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2.7
West Virginia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	3.4	3.5	3.6

NOTE. In constructing this table, it has been sought to present the ratios of the total deaths, exclusive of still-births, registered or enumerated in each state or country for the calendar years given, based upon enumerated or estimated populations at the middle of the year. Death rates for census years are printed in *full-face* type. The European rates are from the tables of International Vital Statistics given in the Fifty-sixth Annual Report of the Registrar-General of England. The rates for New South Wales are those given by Hon. T. A. Coghlan, government statistician, in "The Wealth and Progress of New South Wales," 1893. The rates for the American states, with the exception of Massachusetts and Rhode Island, have been calculated from the deaths stated for the years in question in their registration reports, the population being estimated by average annual increase from the censuses of 1880 and 1890, and from the state censuses of 1885, if such were taken. Still-births are included in the rates given for the United States (census) and for the province of Ontario. For certain states the registration years are not the same as the calendar years given: thus the registration year ends on June 30 in Delaware, District of Columbia, New Jersey, West Virginia, and California, except the years 1881–'83, which are calendar years in the latter; for Indiana, Iowa, and Washington the year ends September 30; the Ohio statistical year ends March 31. The rule of placing the rate under the calendar year in which the registration year ends, is followed in these cases, except for Ohio; the data in this case are assigned to the calendar years to which they chiefly belong. The rates of the United States census are for census years ending May 31, 1880, and May 31, 1890, respectively. The rates for Massachusetts are taken from the "Standard Table," based on geometrical estimates of population, issued by the State Board of Health. Those for Rhode Island are from the latest Registration Report of that state, 1893 (with correction of the obvious error of stating the death rate for 1890 at 20.7 instead of 20.1), but cannot be regarded as satisfactory, since the populations upon which they were based have not been rectified by the help of subsequent censuses. The rates for New York were based upon the total deaths recorded in the Annual Reports of the State Board of Health, but information received subsequently from Dr. T. A. Stuart, assistant secretary, would slightly increase the rates in certain years, owing partly to the reception of delayed returns. The maximum change would be an increase of about 1 per 1,000 for the year 1890.

In connection with this table and diagram, it may be well to briefly indicate what appear to be the most important features, favorable or otherwise, in the history of vital (mortality) registration in the United States during the past fifteen years.

FAVORABLE INDICATIONS.

1. Not one of the states having accurate systems of registration at the beginning of the period has discontinued it. The practical utility of registering the important events of life, although the introduction of a registration system may be difficult at the outset, unfailingly commends itself through experience.

2. Three states, Maine, New Hampshire, and New York, have been added to the registration column. The registration of deaths in New York is a noble monument to the memory of Dr. Elisha Harris, one of the foremost practical vital statisticians of the world, and with respect to promptness and accuracy of results ranks among the best of our American state systems. It is only to be regretted that the material collected for the state is not at present given full statistical use, and that the registration of births and marriages in New York has not kept pace with the registration of deaths.

3. The first indication of coöperation among the registrars of American states was signalized by the agreement of the registrars of New England, made at the last meeting of this Association, to publish a summary of the statistics of the six states. This has now appeared, and well shows the advantages to be derived from interstate uniformity. In too many state reports at present the data are presented as if for communities entirely isolated from the rest of the world, with none of the useful comparisons that serve to enlighten the subject, without which vital statistics frequently become quite unintelligible.

4. Municipal vital statistics has advanced more rapidly than state registration in general, and for many parts of the United States the data collected by cities under purely local regulations afford the only exact information obtainable.

5. The United States government has undertaken work that, if continued, will have a salutary effect upon the isolated systems of registration now in operation. This work consists (1) of the collection of data relating to sanitary climatology by the Weather Bureau of the U. S. Department of Agriculture; and (2) the employment of better methods for the collection and study of vital statistics by the Vital Statistics Division of the Census Bureau under the direction of Dr. Billings.

UNFAVORABLE INDICATIONS.

1. The difficulties under which American vital statistics will long labor from the sparse distribution of the population as a whole, will be dwelt upon in the present article as the most obvious and the most irremediable reasons for our failure as a nation to possess a system at all comparable with those of European countries. We cannot expect accurate registration in any except our most densely settled states for many years.

2. None of the states having imperfect systems of registration has made any material improvement in accuracy during the past fifteen years, although in several, *e. g.*, Ohio, Illinois, Indiana, Michigan, the population is dense enough to maintain an efficient system. One state, Tennessee, adopted a registration law in 1881, and repealed it in 1883, after an experience of twenty months.

3. The most serious blow that the advancement of vital statistics has received, was the failure of the great state of Pennsylvania to adopt a modern registration system, instead of a miserable makeshift, when the question came before her legislature in 1893. Half a loaf is not always better than no bread, when it is a question of vital statistics. Imperfect statistics may be far worse and more misleading than none at all, and it has been the experience of states with imperfect systems of registration, like Michigan, that the very existencc of any system at all acts as an obstacle to the introduction of a better one, and thus retards the coming of efficient registration.

4. There are indifference and lack of enthusiasm on the part of many public health officers on the subject of vital statistics,—more so, I believe, than existed fifteen years ago. There is a reason for this. It is, I believe, the natural reaction from the failure of an attempt to accomplish the impossible or impracticable. As will be pointed out, the accurate registration of vital statistics will not come to pass under natural conditions in most of our states for many years. Attempts in this direction have uniformly resulted in more or less complete failures, and our more fortunate brethren in more densely settled states, where registration has succeeded, not from any greater degree of earnestness on their part or the prevalence of a higher standard of education among their people (although this has its effect) but simply from the fact that the populousness of their states warranted and sustained the necessary paid registration machinery (for registration supported only by medical enthusiasm and scientific interest is doomed to failure) should clearly understand the reasons for the lack of progress in the collection of vital statistics by the western states.

NOTE.—Since writing the above an illustration has come to hand so apposite, as showing the disgust that an efficient health officer must feel in contemplating the dragging, ineffectual progress of the vital statistics appendix of the Western health office, that I must beg to insert it. Dr. J. F. Kennedy, secretary of the Iowa State Board of Health, in an article on "Vital Statistics" published in the *Iowa Medical Journal*, June, 1895, and reprinted in the *Iowa Health Bulletin* for July, 1895, says:

"I wish I could say something in your valuable journal that would stimulate the medical profession—especially the intelligent and progressive portion that are members of the State Medical Society—to report promptly all births and deaths occurring in connection with their practice. I fear our physicians do not realize the importance of such reports, or else do not have sufficient professional and civic pride to do a professional as well as legal duty. . . . .

"I believe from personal observation as a physician, extending over a period of more than thirty-seven years, and from the meagre and imperfect reports in this office, that Iowa enjoys an enviable position as to salubrity of climate, physical vigor, high birth-rate, proportionately low death-rate and longevity. I am sure the figures could be produced to verify this statement, if only the physicians of Iowa could be induced to report as required by law. A laudable and patriotic ambition to do justice to our noble state should alone overcome any reluctance or hesitation because of inconvenience.

"If the profession in Iowa, in the face of the statute and its expressed penalties, in view of the decision of the supreme court, in view of the incalculable benefits of these statistics to the profession and to science, and in view of their material advantages to Iowa, cannot be induced to furnish these reports, *I hope every physician in Iowa will unite in petitioning the next General Assembly to remove from our statutes every section and syllable relating to the registration of vital statistics.*"

INFLUENCE OF DENSITY OF POPULATION ON ACCURATE REGISTRATION.

In the following table the states composing these groups are arranged to show their density of population according to the United States census of 1890. The aggregate population of the registration states is 12,542,416, and the average number of persons to a square mile in the area occupied by them is 105.31. Over double the population is repre-

sented by the states having imperfect systems of registration, but the average density of population is very much less, being only 32.19 persons to the square mile.

POPULATION AND DENSITY OF POPULATION IN REGISTRATION STATES AND STATES HAVING IMPERFECT REGISTRATION.

UNITED STATES AND STATE.	REGISTRATION BEGAN IN —	POPULATION, 1890.	DENSITY OF POPULATION, 1890.
The United States	....	62,622,250	21.31
A. States having an approximately correct registration of deaths, 1895	....	12,542,416	105.31
Connecticut	1848	746,258	154.03
Delaware	1881	168,493	85.97
District of Columbia	1874	230,392	3,839.87
Maine	1892	661,086	22.11
Massachusetts	1842	2,238,943	278.48
New Hampshire	1880	376,530	41.81
New Jersey	1878	1,444,933	193.82
New York	1884	5,997,853	125.95
Rhode Island	1853	345,506	318.44
Vermont	1857	332,422	36.39
B. States having imperfect registration (or enumeration) of deaths, 1895	....	25,908,545	32.19
Alabama	1881	1,513,017	29.36
California	1878	1,208,130	7.75
Florida	1891	391,422	7.22
Illinois	1877	3,826,351	68.33
Indiana	1882	2,192,404	61.05
Iowa	1880	1,911,896	34.46
Kansas	1887	1,427,096	17.47
Michigan	1867	2,093,889	36.46
Minnesota	1887	1,301,826	16.44
Ohio	1869	3,672,316	90.10
Pennsylvania	1893	5,258,014	116.88
Washington	1892	349,390	5.22
West Virginia	1891	762,794	30.95

NOTE.—The expression "registration began in" is somewhat indefinite, usually denoting the first year for which a report was made, but occasionally referring to the date of the law. The compiler will be glad to receive any corrections of the above dates, as in some cases full sets of the reports were not available.

Density of population is admittedly a very important factor in the practical collection of vital statistics, so much so that one might almost say that the page of the compendium[1] of the eleventh census exhibiting the changes in the density of population of the states of the Union according to successive censuses, holds within itself the history of the past as well as the prophesy of the future, of vital statistics in this country.

[1]Part I, p. 6. Also final volume on Population, Part I, page 35.

The reasons for the dependence of successful registration upon density of population are very obvious. It is one of the functions of our social and sanitary administration that only assume importance locally when the number of inhabitants in a given area is fairly numerous. The expense of maintaining a local registration office, the possible distances to be travelled in sparsely settled localities to effect the registry of a death, the frequent deaths that occur without the services of a physician during the last illness and the burials performed with the assistance of neighbors, from the lack of undertakers, and finally, a matter of no small importance, the general adverse opinion of the community, which in unenlightened districts is prone to see signs of unnecessary interference with the liberty of the American citizen in the essential requirements of a thorough registration law, all enter into the problem.

European countries, nearly all of which have accurate systems of vital registration, have generally much denser populations than the United States, or the majority of the states that do not possess effective registration systems. Certain New England states, however, especially Rhode Island and Massachusetts, which have long been distinguished for the excellence of their registration, have populations distributed nearly or quite as densely as most countries of Europe. The number of inhabitants per square mile given for these states and certain other states in the preceding table may be compared with the corresponding data for the leading countries of Europe according to Petermann's estimates.

DENSITY OF POPULATION IN SOME EUROPEAN COUNTRIES.

Country.	Inhabitants Per Square Mile.
Austria-Hungary	170
Belgium	534
Denmark	147
France	183
Germany	235
Great Britain and Ireland	320
Holland	356
Italy	271
Norway	15
Russia	49
Spain	90
Sweden	28
Switzerland	186

The Scandinavian peninsula is the only portion of Europe in the above list that approaches the United States in the low degree of density of population. Registration is facilitated in Sweden and Norway by means of the personal control exercised over each individual through the certificates issued at the time of confirmation; nevertheless the records of deaths do not appear to be maintained in Norway with the precision that

characterizes more densely settled European countries. Thus, in 1891, only 19,019, or 54.05 per cent. of the total number of deaths returned in Norway, 34,856, had the causes of death certified to by physicians.[1] Russia with over double the average density of population of the United States, does not possess at present a satisfactory system of registration. It should be remembered, moreover, in comparing the condition of registration in Europe and this country, that the stronger governments of Europe possess facilities for executing administrative duties of this character that would not be permissible in America.

Turning again to the United States, the group of registration states is nearly identical with the North Atlantic division of the Eleventh census, which division has over three times the average density of population of any other division of the United States, and comprise nearly one half (49.31 per cent.) of the entire urban population of this country. For exact agreement it lacks only Pennsylvania, a state whose populousness is amply sufficient to maintain a thorough registration system, and contains in addition to the North Atlantic division, the state of Delaware and the District of Columbia from the South Atlantic division.

Even the group of states having imperfect systems of registration stands considerably above the general average of the country in respect to density of population. There are, as might be expected, wide differences between certain states of this group, but it should be remembered that the general average of density of population, while it affords a clue to the general distribution of the inhabitants, does not always tell the whole truth in regard to the practicability of registration. Thus California, with its deserts and thinly settled mountain regions which reduce the average density of population of the state to only 7.75 persons per square mile, has a large proportion of its population in much closer aggregation in the cities and towns of the valleys and along the coast, and in consequence a much more efficient registration is possible than would at first appear. The same is true of Maine, which state showed a remarkable degree of completeness for its first year of registration, 1892, the returns giving a mortality of 18.4 per 1,000 estimated population,[2] a death-rate fully comparable with those of any of the other New England States.

LIMITATIONS OF VITAL REGISTRATION.

Taking into consideration the general history of the registration of vital statistics in this country and in the world, in connection with the observed density of population in those states and countries having reliable systems of registration, we may venture upon some general observations in regard to the subject, and even conjecture the probable lapse of time necessary for the realization of the National System of Vital Statistics

[1] Beretning om Sundhedstilstanden og Medicinalforholdene i Norge i Aaret 1891. Kristina, 1893.
[2] Summary of the Vital Statistics of the New England States, Table IV, p. 15. Boston, 1895.

which Dr. Harris, in common with many other American students of vital statistics and sanitary science, looked forward to with such immediate expectation.

1. There is an inferior limit of density of population, below which accurate registration is not possible, or at least is not practicable, under ordinary conditions. Where the inhabitants of a state are distributed with uniformity, an efficient system of registration can hardly be expected with a population of much less density than forty persons to each square mile. New Hampshire, Vermont, and Maine cannot well be considered exceptions to this rule, since their inhabitants are in reality grouped considerably more densely in the actually settled area than the average density of each would indicate. In the case of the latter, moreover, the existence of flourishing systems of registration in all the other New England States must have had no inconsiderable influence in bringing about the establishment of a state system of registration considerably earlier and of more efficient character than would have otherwise occurred.

2. There is a superior limit of density of population, above which an efficient system of vital registration, under our present conditions of knowledge, is recognized as an indispensable adjunct to the public health administration and an invaluable source of sociological information. This limit varies, of course, with the intelligence of the people. It may be expected to become lower with advancing years. At present we may place it at about one hundred inhabitants to the square mile. Of the registration states, Maine, New Hampshire, and Vermont, for reasons already hinted at, are considerably below this limit. Delaware is slightly below it, but none of the non-registration states exceed it with the exception of Maryland and Pennsylvania.

3. The United States as a whole is still far below the minor limit representing the degree of density of population, at which accurate registration becomes generally practicable. Taking this limit at about 40 persons to the square mile, there were only 21.31 persons to the square mile according to the census of 1890, excluding Alaska and the Indian Territory. In the preceding three decades the density of population had a little more than doubled. With the decrease in immigration that has obtained in recent years, we can hardly look forward to an average density of population amounting to 40 persons to the square mile before the close of the second decade of the next century. From this point to that degree of density at which a successful registration system becomes not only practicable but fairly to be looked for as a matter of course, is a long cry. Professor Pritchett's estimate[1] will do as well as any to judge of that far distant time, which will be in the *fin de siècle* years of the twen-

[1] A Formula for Predicting the Population of the United States, by Prof. H. S. Pritchett. Publications American Statistical Association, June, 1891. According to this formula the population of the United States will be 114,416,000, or nearly double the present amount, in 1920, and 296,814,000, or nearly five times the present population (approximating 100 persons per square mile), in 1980.

tieth century. At that time we may fairly hope with Dr. Harris that each of these United States, if left entirely to their natural necessities as determined by their increase in populousness, will have an accurate system of vital statistics in operation furnishing results perfectly comparable with those of other states and foreign countries. This is, of course, without taking into consideration any possible advance in public opinion during the next century, whereby men in general may come to believe that statistics bearing directly and helpfully upon the most sacred functions of human life are at least as well worth liberal treatment and careful attention as those that pertain more directly to the pocket. Even under the most favorable circumstances, however, we can hardly expect this result to come about spontaneously before the middle of the twentieth century.

MEANS FOR HASTENING THE ADVENT OF ACCURATE REGISTRATION.

Shall we, then, be forced to await the slow process of natural evolution of a general system of vital statistics in the United States, which may be deferred under the most sanguine expectations to the remote future? Or are there measures by which we may attain, at least, the benefits of a thorough, though partial, registration, while the country is slowly increasing to a degree of wealth and density of population that will justify and inevitably demand an accurate registry of its movement of population? It seems to me that much may be done at present to obtain not complete mortality returns from the entire country, but thoroughly representative returns from such selected portions of it as to be of the greatest value to our sanitary administrations, of use to students of sociology, and directly comparable with the mortality rates of other countries.

We should utilize, in the first place, the results of municipal registration of vital statistics in the United States. The urban population of the United States (including only places of 8,000 inhabitants and upwards) consisted in 1890 of 18,284,385 persons, or 29.20 per cent. of the total population of the country. There are provisions in the charters and ordinances of nearly all of the cities in this country (judging from a careful examination of those of the cities of my own state, which may be taken as fairly representative[1]) authorizing the immediate registry of deaths and the issue of burial permits based upon certificates of death, and which, if fully enforced, would result in a fairly satisfactory mortality registration. In most of the cities of 8,000 inhabitants and upwards, the work of registration, more or less carefully conducted, is actually going on. There are needed, in addition to the present methods, only certain provisions for more careful administration and supervision of the work, and for the collection and utilization of the results by some central bureau. In 1890 the population of the nine registration states and the District of Columbia amounted to 12,542,416 persons; if to this number we add the urban

[1]Twenty-sixth Annual Registration Report of Michigan, 1892, pp. 284–320.

population outside of the registration states amounting to 11,129,230 persons, we shall have an aggregate registrable population of 23,671,646 persons, or 37.80 per cent. of the total population of the country.

The system of reporting statistics of mortality and of the prevalence of diseases in this country put into operation during the present year by the Weather Bureau of the United States Department of Agriculture, seems to promise valuable assistance in this direction. As sanitarians interested in the improvement of the vital statistics and registration of this country, I believe that we should heartily commend this important movement and assist, as far as may be possible, the correct reporting of the diseases prevailing and the causes of deaths in our several localities.

Another way in which the advent of general registration may be hastened is the prevention of retrograde action on the part of any states in relation to the subject of vital statistics, and the securing of the adoption of a satisfactory registration law by those states that have advanced sufficiently in density of population to guarantee its successful administration. The essentials of modern registration should be clearly presented to the medical profession and the general public, so that the appalling ignorance that not infrequently appears when the subject comes up in state legislatures would be less in evidence. Had Pennsylvania, in 1893, joined the ranks of the registration states, to which she properly belongs, in company with New York, we should have had the entire North Atlantic division properly represented in a reliable system of mortality registration. That she failed to do so, that she embraced the discarded plan of collecting births and deaths by a periodical enumeration, slightly improved by being performed semi-annually instead of annually as in Michigan, and that the particulars obtained under her present law are very meager and are not required to be returned to a central bureau for compilation and publication, whereby they would have become of scientific value;—all these regretable blunders are reminders that those interested in advancing the cause of vital statistics in this country should be on the alert lest such grand opportunities again escape them.

There is, fortunately, a way by which the interest of this association in the improvement of our state registration systems may be readily manifested, and by which good results may probably be secured. The boards of commissioners appointed by many of the states to bring about, by voluntary state action, greater uniformity in the statute laws prevailing in the different states and territories, are working exactly in the direction which any movement for a general registration system in this country must take. They have already recommended important legislation relating to marriage and divorce; their hearty support of measures looking toward uniformity in the registration of births and deaths in the several states cannot be doubted. It only remains to exhibit fully the importance and essential requirements of such registration in order to enlist the services of this very influential organization in the cause of improved

vital statistics, and I hope that the American Public Health Association will at this meeting appoint a committee to memorialize the boards of state commissioners, through their National Conference, to this effect.

Again, the change in the methods of the United States Census relative to the collection and study of vital statistics should be encouraged and extended. The enumeration or ordinary census method has long been a recognized failure in its application to vital statistics. It would be well if it could be entirely discarded in the collection of the vital data for the census of 1900, and be replaced, as far as possible, by approved methods. The practicability of such a change has been fully demonstrated by Dr. Billings's studies of the mortality of several of the larger cities of the United States for the six years preceding the last census, based upon the results of their local systems of registration. It is to be hoped that these studies will be continued for the individual years of the decade 1891–1900, and will include other cities and registration states.

For many reasons it is desirable that there should be a permanent census establishment, both on grounds of economy and improved service. The machinery of a great census should not be entirely dismantled when the period of its immediate activity is over, but it should be reduced to a peace footing for a time, during which extended investigations and the preparation for sudden activity could go on quietly and economically; then when the date of the census arrives, there would be a staff of trained experts to serve as officers in the army which is raised so rapidly, goes into action with such intensity, and which is disbanded about the time that its duties are fully learned under the present system.

One of the most important divisions of a permanent Census Bureau would be the division of Vital Statistics, inasmuch as one of the most essential conditions of the successful collection of vital statistics is continuous and not intermittent activity. Of course, such a division would not undertake to collect vital data for the entire country directly, at least at first, but would avail itself of the facilities already in existence. Its first duty would probably consist of the organization of the already established systems of municipal and state registration into a harmonious whole, —work that the weather bureau has already begun in part, but which, I believe, could be better carried out in its entirety by the census. It would be essential that the methods of collection of data be made fairly uniform in all the cities, and that regular inspection of their efficiency be made. The local registrars would be to a certain extent in the government service, and their returns would be made at frequent regular intervals to the Bureau at Washington, and there be made available for any important uses. Another feature and this I regard as most essential, of the permanent Division of Vital Statistics in the Census Bureau, would be the establishment of registration stations in the non-registration states for the collection of vital data in regard to their rural population. Each state that does not have an accurate system of state registration should have several counties in different parts of it carefully set apart as

fairly representative of the whole, in which, with or without state assistance, a continuous registry of births and deaths should be maintained. The expense of maintaining such stations in several counties of a state through the ten years of a census period ought not to exceed the cost of obtaining the imperfect data for the entire state by enumeration for a single year as at present conducted, while the statistics collected would be immensely more valuable than those collected under the old system. Furthermore, such stations would serve as models of registration methods and illustrations of the practical value of vital statistics to the states in which they might be located, and would thus influence the adoption of a proper registration system for the entire state as soon as the density of population increased sufficiently to warrant it.

I have not referred to the collection of vital statistics as being a very important function of the United States Department of Public Health, if this be established. In the bill proposing the organization of such a department of our government, as prepared by the American Medical Association, the "Secretary of Public Health" is "to procure and tabulate statistics of marriages, births (noting those that are illegitimate), and deaths from epidemic, endemic, and all other diseases," deriving in his formation from the "voluntary co-operation of state and municipal authorities, of various general and special hospitals, sanitariums, public associations, and private persons." While it is very desirable that the registration of vital statistics, and especially the statistics of causes of death, be conducted under the supervision of competent medical authorities, and while the practical administration of the registration of vital statistics in most of our states has fallen into the control of their boards of health, it is by no means certain that such an arrangement is the best one. In my opinion the registration office of a state or country should be entirely separate from the public health administration, although working in perfect harmony with it, as in England; and it may thus result that the final form of the "Registrar-General's Office" of our government may develop best through a process of evolution as a branch of the Census Bureau, rather than as a part of the proposed Department of Public Health.

In concluding this paper, I am glad to say that certain suggestions based on the preceding remarks, and relating especially to the influence that we as individuals and as members of this association may exert in hastening the time of accurate vital registration, have been embodied in resolutions, which have received the sanction of the Committee on Vital Statistics, and which I trust will be recommended by the executive committee for your favorable action. I believe that it lies within the province and power of the American Public Health Association to materially aid the progress of accurate registration of vital statistics in this country, and that the accomplishment of this important sanitary measure will be not the least glorious of the achievements in the cause of Public Health in which it has already had, or is to have, an honorable share.

DEGENERATIVE HEREDITY, OR SOME DEGENERATIVE INFLUENCES OF MODERN CIVILIZATION UPON HEALTH.

By CHARLES DENISON, A. M., M. D., Denver, Col.

FIRST PROPOSITION.

The advance in the healing art, in so far as the saving and prolongation of life is concerned, suspends the law of natural selection, and permits the weak to propagate their kind.

The facts of heredity need no demonstration in this enlightened day and generation; they are the common place of knowledge. Grant Allen gives the Weissman theory when he declares that "what man is, he is already potentially at birth; whatever little can be added by himself is at best but an infinitesimal fraction, compared with what he derived directly from his parents, or indirectly from his earlier ancestry." The peculiarities of offspring, and their similarities to their progenitors, are expected to appear, not only in kind but at the times or ages when pre-existent in the parent. So much is this the case with all characteristics, that Darwin proclaimed their inheritance as the rule, and their non-inheritance as the anomaly. The facts are undisputed, but the peculiarities and vagaries of inheritance remain unexplained, notwithstanding the intense interest the subject of heredity has always excited in all enlightened communities. Science has not yet satisfactorily elucidated the reason why a generation is skipped in the manifestation of certain characteristics in one instance, and the inheritance is direct from the father or mother in another; or why characteristics inherited seem to cross from father to daughter or mother to son, or come from one parent to both sons and daughters.

DeCandolle's researches show that distinctive traits are oftener transmitted from the father than from the mother, especially those pertaining to the higher faculties; while some investigations of my own, over twenty years ago, based upon the opinions of many medical men, strongly indicated that physical states (tendencies to disease) were oftener contributed by the mother than by the father.

But the awful responsibility of heredity, when considered as perpetuating and even doubling diseased tendencies in the offspring, is the particular phase of this subject which now demands our attention. The question is of far greater importance than the prevalent apathy and the blind fatalism and sentimentality extant, as to the passion of love, would seem to indicate. If there is anything in the old adage, "Love goes where it is sent," then it is indeed possible that a sensible enlightenment

of marriageable young persons as to the dangers of disease inheritance might do much good, and the anxieties and fearful disappointments of tainted alliances be thus avoided.

It is with no disrespect for religious beliefs or the dictum of the pulpit, or any special antagonism to authors of fiction who deal in sentiment and expound social customs, that I, a physician, seek to have this question considered from the scientific standpoint of evidence, the results of the observations of natural laws. Admit, if you must, that sentiment and theory are subverted and ignored by the cold facts required in a physician's logic, there is at least a good basis of truth in his conclusions, and it is to these truths with regard to the heredity of disease, especially the tendency to or aptitude for tuberculosis, to which your thought is invited.

The inherited diseases are considered to be goitre, leprosy, gout, scrofula, tuberculosis, cancer, syphilis, rheumatism, eczema, and the neuroses such as epilepsy, insanity, chorea, hysteria, and asthma.[1]

The taints of gout, leprosy, and cancer are more general than their actual manifestations indicate, because, coming as they do in old age, the predispositions thereto may not have had a chance to show themselves in those dying of acute diseases. The neuroses seem to be correlated, *i. e.*, the inheritance may or may not be of the same kind in the offspring. So also, it seems to me, are cancer, scrofula, tuberculosis, and malaria, at least in the actual manifestations of these diseases. Malaria seems to have a very intimate relation to tuberculosis; cancer, according to my records, certainly predisposes to tuberculosis in the next generation; and as for scrofula, the diagnostic powers of tuberculin show this glandular condition to be tubercular oftener than was ever suspected before Koch discovered that agent.

The power to resist disease is an inherited gift which ought to be recognized more than it is, and the same can be said of the unusual susceptibility in some families to certain contagious diseases—so marked in the mortality records of scarlet-fever, diphtheria, whooping cough, and measles. The composite biology of the offspring is unable to resist, or actually intensifies, the morbific influences of these dread infantile diseases, and an infant mortality results which greatly modifies any rule for determining the excellence or failure of family strains. This peculiar characteristic I shall presently make use of in a rule I will attempt to formulate, because I believe that an individual's susceptibility to, or natural opposition to, disease is almost always an inherited proclivity, and that, too, in no small degree. While all our human evidence—and I can here present only a small part of it—points in the same general direction, I will first ask you to go aside with me to briefly examine the striking proofs furnished in the high breeding and in-breeding of animals.

Nature's law is always in favor of harmonious development; this is

[1] Organic heart disease, diabetes, emphysema, haemophilia, lithiasis, and color blindness are thought to hold a secondary positlon as to the probability of inheritance.

the acme of success. The human race can learn much from this the only kind of success Nature will stamp as permanent in the breeding of animals. It is really inharmonious development that the breeders of cattle are now obtaining in the fatal degeneration which they are introducing into their high-bred families. It makes no difference whether it is for increasing the quality and quantity of milk given, as in the extreme types of the Jersey or the Holstein, or for the weight and fattening proclivities, as in the Shorthorn or Galloway; it is the breaking of a natural law by the constant doubling of like strains, which leads to degeneration. This high-breeding becomes practically the same as in-breeding, a similarity which, by the way, could be pointed out as well in the human family, if time permitted.

Dr. Greswell, the very capable state veterinarian of Colorado, says that intense breeding in any direction in animals produces not only this degeneration, but eventually sterility as well. His has been no common experience in this line, and convinces one that high-breeding is not only synonymous with in-breeding, but the latter is synonymous with scrofula, and this in turn is synonymous with and surely leads to tuberculosis, which finally is the doom of every high-bred herd. Dr. Greswell makes the statement advisedly that if the tuberculin test were allowed to decide (and he esteems this test superior to all others), "not a noted family of (1) Jerseys, (2) Short Horns, (3) Devons, (4) Holsteins, (5) Herefords, (6) Guernseys, or (7) Galloways could remain." He speaks of them, not as individuals, but as families of the highest grades, the majority of which would be condemned. He further states that in the United States even 28 per cent. of full-blood Jerseys would succumb to this test; while in England the ratio would be 35 or more out of every 100. Is it then so very strange that the influential owners of these overbred strains in England, and to a certain extent their associate boomers in this country, make common war against such a splendid test, and will not allow it to be used in their herds? The pecuniary loss would be enormous if the truth were to be known! This is a serious question, which we have not time here to consider, if, indeed, it is true, that the queen milkers of the world, the Jerseys, are thus contaminated with tuberculosis! That this is the direct result of high-breeding and in-breeding is likewise shown by the experience with the Short Horn family for beef purposes. Crowded feeding and intense in-breeding here give a great activity to the conversion of food into blood; the red corpuscles do not have time to form, and the white corpuscles are found to be much increased in size and number. A weakened blood state is thereby created, which is most favorable to the invasion of scrofula and tuberculosis. This process is pushed sometimes to the point that the overcrowded blood vessels rupture in the brain, and death puts a stop to the scheme.

NOTE. Dr. Greswell describes such an instance in England, where, after the death of two calves, the progeny of a brother and sister of a noted Short Horn family (and

these the result of a like in-breeding for two generations back), he succeeded in keeping a third, a bull calf, alive by repeated bleeding and the use of digitalis, and finally by the aid of three foster mothers the fellow was reared, and at one year of age was sent to Australia weighing over 1,200 pounds.

Such fruitful soil for tuberculosis created in dumb beasts finds its analogue, as we shall presently see, in the highest ranks of the human family, where, it would seem, there ought to be good sense enough to prevent it. To be sure, the law declares that the sins of the fathers are visited upon the children to the third and fourth generation. Yet, because there is a specific cause in the germ of tuberculosis, not a few people discredit the general belief, previously held, of the hereditability to this disease which probably has to do with a fourth or more of the world's mortality. A dozen illustrations selected from a couple of hundred of any cases of tuberculosis, taken at random, ought to convince the most sceptical on this point. For instance,—

1. Male, seventeen, mother had three children, and died at forty-three of consumption when this patient was nine. One of these children, a sister, died of consumption at seventeen.

2. Male, nine, an only child of a possibly tuberculous mother; one of a family of seven children, four of whom had died of consumption; and the father, one of a family of nine, five of whom died of the same disease, and the father died of phthisis when this patient was two months old.

3. Female, twenty-six, mother died of consumption, also patient's two sisters and a brother; another sister is insane, and the majority of a large family (ten) died young.

4. Male, thirty-eight, mother died of consumption at fifty-five, also her father and her two brothers and a sister; father's mother also.

5. Male, thirty-three, mother died of consumption; out of her eleven children four are living; and three brothers and a sister have died of the same disease.

6. Male, thirty-five, mother and father cousins; five out of eight children died young.

7. Male, thirty, mother's father and mother were cousins; father and mother are healthy, but six out of eight of their children died from fourteen to thirty of consumption.

8. Male, twenty-eight, mother and father cousins and now well; family intermarried for three generations; five out of patient's eight sisters died of consumption.

9. Female, twenty-six, out of four children, sisters, two have tuberculosis and other two have died of it. Mother died of "tumor of the liver" at sixty-four, and three out of six of her brothers and sisters died of consumption.

10. Female, twenty-four, father died of consumption at thirty-four, and three out of his children died of same disease; nine in father's family, and all died before thirty, much like father.

11. Male, twenty-three, father and mother both died of consumption; father had hemorrhages at twenty-one and died at forty-two, when this patient was seven; mother was weak and small, and died eight months after his birth.

12. Female, twenty-three, father died of cancer at sixty-three, mother of consumption at fifty-three, and two sisters out of six children died of consumption.

Averaging the last 1,000 of my tubercular cases seen, extending back about six years, I have the following results to present: Inheritance, 38 per cent.; non-inheritance, 62 per cent.; of the former, 40 were cases of either extreme or double inheritance; while of the latter, in 20 there was almost positive proof of infection, as when a husband or sister was

nursed by the patient. The large percentage in the heredity class (38) should be explained as due to the many factors allowed in indicating a family tendency, viz., if a father or mother, or two or more of either aunts, uncles, or grandparents, or two or more of brothers or sisters, died of consumption.

Dr. J. E. Pollock's analysis of 1,200 cases, giving inherited tendency in a little over 30 per cent., undoubtedly did not include any record of the brothers and sisters. See "The Elements of Prognosis in Consumption."

Dr. Austin Flint, Sr. ("Phthisis," page 73), found in 220 cases of phthisis a ratio of 24 per cent. in which what may be considered positive inheritance existed.

Dr. Walsh ("Diseases of the Lungs") found that in 26 per cent. of his consumptive cases one or both parents had died of the disease.

One thousand and ten cases of the Brompton Hospital Report included only parents, and gave an average of 24.4 per cent.

Dr. Cotton's 1,000 cases, mentioned by Dr. C. Theodore Williams in his work on "Pulmonary Consumption," included parents, brothers, and sisters, and gave 36.7 per cent.; while Dr. Williams's own list of 1,000 cases gave 48.4 per cent., but his estimate included cousins and a single brother or sister; while in my list I have required two of the latter only, or of uncles or aunts or grandparents, to establish a family tendency. Dr. Williams concludes,—

1. Family predisposition prevails among and exercises a more decided influence on females than males, and the former have a greater power of transmission than the latter

2. Fathers transmit more frequently to sons and mothers to daughters than the con verse. Paternal inheritance whilst most unfavorable for the males, is less so for females, as it generally includes an increase of resisting power.

4. Maternal inheritance is unfavorable for both sexes, and most so for the males.

5. Double heredity exercises the greatest influence, and affects sons more strongly than daughters.

6. Family predisposition does not directly shorten the duration of the disease.

7. It precipitates the onset of the disease, and this shortens the duration of life.

This evidence is corroborated by the experience of such distinguished specialists as Dr. J. E. Pollock, Dr. Austin Flint, Sr., Dr. Walsh, Dr. Cotton, Dr. C. Theodore Williams, and Dr. Edward Smith of London.

NOTE. Dr. Edward Smith, of London, analyzed 1,000 cases of consumption as to inheritance, and found, of 600 males and 400 females, there was inheritance in about 24 per cent., and these patients were members of large families, averaging 7.5 children to the family. Of these children 40 per cent. had died, and of the married patients' children 38 per cent. had died, which, considering the average age of these patients at time of inquiry, viz., 28.8 years, are unusual percentages. In 43 per cent. the general state of the health of these consumptives' children was bad, and abortions had occurred in 46 per cent. of the patients who were child-bearing married women. Aside from the evidence adduced that these patients had been born feeble and had feeble and short-lived children, it was further conclusively shown that a large majority—70 per cent.—had suffered from the effects of injurious occupations, and many had been injured by the anxieties and immoralities of life. In fact, as usual with this class, they were an unpromising lot to propagate from, and in many instances so were their progenitors.

It is thus true that heredity, which I believe is underestimated in our usual calculations, plays an important part in the dissemination and perpetuation of tuberculosis. I do not attempt here even to discuss the possibility of a direct transmission of the bacilli of tuberculosis through

the ova or spermatozoa. This much we are sure of, that there is a transmission to offspring from parent or parents of a remarkable susceptibility, and of peculiarities of blood and vitiated vitality, which furnish the required pabulum or field for the growth of that microbe. The soil and conditions under our present civilization are constantly made more favorable for the development of the disease, while our ability to combat it is also increased under our advanced knowledge of its etiology and arrest. But with all our splendid climatic and other advantages, arrest is not the eradication of the disease; on the contrary, the total of hereditary influence is necessarily increased, because more affected persons survive. Undoubtedly the increasing average of longevity of civilized people is in no small degree due to the prolongation of the lives of chronic invalids.

Thus it becomes an open question, Do not the valetudinarians equal the healthy in longevity? Consequently it results that Darwin's law—the survival of the fittest—is in danger of becoming obsolete; while the total of bad inheritances is in no sense lessened. The vicious seed is not destroyed but preserved to be again mixed with the good. "Like begets like," only more so in the case of these recovered consumptives; and it becomes a serious problem how a community like that in Colorado, largely made up of recovered invalids, will be governed in future, that a normal state of health may be assured to her inhabitants.

SECOND PROPOSITION.

The present civilization stimulates the intellectual and nervous system to such an extreme as to injure the physical (reproductive) powers and favor sterility.

Man more than any other animal is made by his environment, because more than any other animal his capabilities for influence therefrom are greater. The most distinctive characteristic of man, as compared with animals, is emphasized in effective language by Henry George in his "Progress and Poverty:" "He is the only animal whose desires increase as they are fed: the only animal that is never satisfied. The wants of every other living being are uniform and fixed." The only use other beings "can make of additional supplies or additional opportunities is to multiply. But not so with man. No sooner are his animal wants satisfied than new wants arise." Man parts company with the beast when the wants of food, shelter, and the gratification of the reproductive instincts are satisfied. Then his evident destiny is away from and above the beast; it is no longer quantity which is man's incentive but quality. "The very desires that he has in common with the beast become extended, refined, exalted. It is not merely hunger but taste that seeks gratification in food; in clothes he seeks not merely comfort but adornment; the rude shelter becomes a house; the indiscriminating sexual attraction begins to transmute itself into subtle influences and the

hard and common stock of animal life to blossom and to bloom into shapes of delicate beauty. As power to gratify his wants increases, so does aspiration grow."

This mastering incentive to excel, admittedly the source of improvement of the race in refinement and power, is nevertheless undoubtedly a principal cause of the decadence of that race in physical well-being. There is a weakening at the top, portending the not distant extinction of that quality, unless it be constantly replenished from the lower orders of the race.

In the social world the unfortunate demands of caste, and the appreciated cost of the honors and responsibilities of parentage,—each generation seeking to outstrip its predecessor in the comforts and refinements of life,—too often furnish excuses for a celibacy or a state of immorality which deprives the earth of what ought to be, under more favorable circumstances, its most prosperous increase. In the intellectual world the same incentive to excel, the demands of time and study necessary to proficiency in professional life, furnish further and additional excuses, with those who do marry, for a delay in assuming the responsibilities of parentage, till the total effect can be seen to be the gradual extinction of these higher classes.

Kidd, in his "Social Evolution," nicely illustrates this loss of productive years through delayed marriage among the intellectual classes, and seconds Dr. Ogle in his conclusion, read before the Statistical Society of London, in March, 1890, "that the lower the station in life, the earlier the age at which marriage is contracted, and the difference in this respect between the upper and lower classes is very great indeed." Galton, in his "Hereditary Genius," makes a comparison of one class of men who marry at say 22 years of age and another at 33, the latter presumably representing those in professional life, and shows that, allowing for the usual progeny which would be expected from such differences alone, the former class in a single century would increase two and one half times over the latter. In two centuries the progeny of the first class would six times outnumber the second, and in three centuries more than fifteen times.

The exact figures as to the average marriage age of different classes are given in the English census, for miners 24 and of their wives 22½ years, while the ages for the professional and independent class are seven years more for the husband and four years added for their wives. Here is an actual difference considering the few in the upper compared with the many in the lower grade, which is a positive proof of the numerical weakening of the intellectual class.

This argument is independent of one probably equal in its importance (could all the facts with reference to it be presented), viz., that the shirking of the responsibilities of motherhood is successfully carried on to a probably much greater extent among the higher than the lower orders of

civilization. The tendency to sterility is greater independent of the above, as will be inferred later on. Again the proportion of permanent bachelors among the professional and independent classes, as found by Dr. Ogle, is far above the rest.

This all serves to confirm the true statement of Royce, in "A Study of Genius," that "mental exertion actually restricts the reproductive energy." This tendency to degeneration and to consequent race extinction among those classes devoted to advanced intellectual pursuits, is by no means a peculiarity of sex. That women are not exceptions to the rule is shown by the remarkable paucity of healthy children born of members of high-class women's debating and literary clubs, as well as of authoresses, lecturesses, and female physicians.

The practice in England of purchasing a title by heiresses, reveals a remarkable tendency to sterility in those high-born females. Of course, according to English law, they must have been usually the only child in order to have inherited; and the physical degeneracy of their noble parents shows itself in their own inability to continue in existence either the strains of their own families or that of their purchased peers. Galton ("Hereditary Genius"), remarks this tendency and concludes: (1) out of 31 peerages there were 7 in which the hereditary influence of an heiress or a co-heiress affected the first or second generation; that in 16 out of 17 peerages their influence "was sensibly an agent in producing sterility;" (2) that the direct male line of no less than 8 peerages was actually extinguished through the influence of the heiresses, and that 6 others had very narrow escape from extinction, owing to the same cause. Out of 12 peerages that have failed in the direct male line, no less than 8 failures are accounted for by heiress marriages; finally that 100 marriages of heiresses resulted in an average of 4 children born to the family, while to 100 peers not married to heiresses the average per family was over 6. This evidence of degeneration is the more striking in view of the great incentive to these peers to perpetuate their line through a male offspring. How subtle are these proofs of the destiny which awaits that class which thus ignores the laws of Nature.

When we come to consider the lives of those in positions of power and influence, chiefly because of wealth, the evidence of this law of decadence is not less startling. We do not have to go back to the Roman Empire when the Romans under Cæsar created from the plebians a competent number of new patrician families "in the hope of perpetuating an order which was still considered as honorable and sacred."

Says Benjamin Kidd: "The existing aristocratic families amongst the modern European peoples are continually undergoing the same process of decay. The manner in which the English aristocracy (which has been to a large extent recruited from those who, in the first instance, attained to the position by force of character or intellect) is continually dying out, has become a commonplace of knowledge since the investigations of Gal-

ton, Evelyn, Shirley, and others threw light on the subject. Only 5 out of every 500 of the oldest aristocratic families in England at the present time, can trace a direct descent through the male line to the 15th century." In France and in all other countries where there is an aristocratic class, the same state of things is known to exist. There is something radically wrong about aristocratic and plutocratic life. Perhaps it is the greed and pride engendered by wealth and power that invariably leads to this decadence by extinction which Nature imposes upon those classes and systems existing in contravention of her laws.

THIRD PROPOSITION.

The social, commercial, and manufacturing phases of our civilization favor indoor and effeminate modes of life which are detrimental to successful development, and inheritance propagates the depreciated life-force.

The changes in the economical conditions of our times, compared with those of 50 or 100 years ago, are too well-known to need more extended proof. These changes are particularly noticeable in the size of the family, and the employment of its members. For instance, take the history of any family, and where are the representatives of those who constituted an industrious household in old New England times? As to numbers, according to a genealogy I have in mind, the families of 8 to 12 children, nearly all hardy representatives of the agricultural or professional classes, have dwindled down in six generations to from one to five members per family, and one half of these devoted to clerical or indoor occupations. Then society was made up of the producing and the professional classes. Now the growth of invention, the multiplication of machinery, and the centralization of mechanical industries in the cities has built up a vast middle class, between the agricultural and professional, who far outnumber the others. Referring to the statistics of the last census (1890), and classifying those engaged in what may be considered as outdoor occupations in contrast with all others, we have the following result: Agriculture, fisheries, and mining, about 9,000,000 souls; professional service, domestic and personal service, trade and transportation, manufacturing and mechanical industries, all together about 13,700,000. In how many offices, shops, or factories, the clerical force and the detail toilers many times outnumber all others connected with those establishments? There is then much more of confinement to indoor life, whether in sweat shop, factory, or counting house, and long hours, cramped positions, and jaded nervous systems, help to constitute and establish a defective parentage, if forsooth marriage is consummated at all.

FOURTH PROPOSITION.

The independence and self supporting of women in clerical positions removes from the probability, if not the possibility, of successful motherhood,

a considerable proportion of the so-called gentler sex, through the resulting great decrease in matrimony and the exhaustion of the vital powers of women in nerve-taxing occupations.

It is not merely that there is an increasing disinclination of intelligent women to take upon themselves what to the "new woman" are the unappreciated honors of motherhood, nor solely that under the fostering influence of female suffrage women are encouraged to assume the prerogatives of men and drive them from many clerical duties the women can confessedly perform just as well; but the tendency of social life and business economics is toward making way for the employment of women in business circles, and granting to them the gratification of their new ambition—their so-called "enlarged sphere." One needs only to compare the records upon this point of the census of 1890 with that of 1880, to see the force of this argument. Of those engaged in all business occupations tabulated, the males increased 27.6 per cent., while the females so employed increased 47.9 per cent., or, to specify classes of occupations, under professional service males increased 48.5 per cent., and the females recorded 75.8 per cent. increase. Domestic and personal service, males increased 16 per cent., females, 41. 2 per cent. Trade and transportation, males increased 71.7 per cent., females, 263.2 per cent. Manufacturing and mechanical industries, males increased 46 per cent., and females 62.9 per cent.

The curse of child labor, too, early "breaks them into" lines of confined and wearing occupations, depriving young girls of needed schooling and physical development which would otherwise fit them for maternity.

Considering the chief and most enduring function of women to be the bearing and guidance of the young, what a large class of them fall short of this, their created purpose, to the extent that they are simply passing incidents of the world in which they had lived! These healthy, independent women are, however, better suited for motherhood than those who are left to take their places. Civilization has to fill innumerable gaps and start new genealogies from baser materials.

It is a question of quality of offspring not quantity; no argument in favor of increasing the population of the earth is intended; but it is desirable that the most civilized peoples of the globe should hold their ground and not be crowded out of existence by their failure to comprehend Nature's laws.

Evidence sufficient could be adduced, did time permit, that the ancients were wiser in selecting the fittest to live and become citizens, than we, of this sentimental and unsystematized age. There is only time now to mention the claim of such writers as Galton, Lecky, Kidd, and Gladstone, that intellectual power was actually higher in Grecian times than in our own.

FIFTH PROPOSITION.

The present unaided efforts of natural selection should be supplemented by warning the young before matrimony; the masses ought to be educated physiologically that the laws of heredity may be understood, that physical development and mental strength may be appreciated, and the responsibilities of parentage recognized. The state and the nation have a duty to perform.

Dr. Smith of Greencastle, Ind., asks these questions, "Cannot science be made to aid or even displace sentiment in mating the sexes? Would men and women love each other less if they knew each other to be anatomically perfect? Is it necessary carefully to conceal from lovely woman the chief reason for which God created her, until after she is married and has the fact suddenly thrust upon her mind that she has made a mistake which can never be corrected? Should we not use the same intelligence that the breeder of stock or the horticulturist uses?"[1]

There is very little question in my own mind how the great majority of the medical profession would answer these queries, and were it not for our servitude to the very sentimentalism we deplore and our deference to custom, we would organize to put in effect the reforms needed. As it is, the question is now before us and must be met. Its importance is foreshadowed in the words of Alexander Walker when he says, "Improvement of their race will be the prerogative of the highest minds, and will be more eagerly sought for than ever was the improvement of the inferior animal breeds." The question is a vital one to every human being, and if not recognized to be so before marriage it surely will be afterwards. Let it be argued that "love will find a way" to defeat the will of science and continue to disregard Nature's laws. What of that? The great mass of young people do not know, or cannot comprehend, the import and responsibility of marriage. They mean well enough, but they have not been properly educated in this matter. Only put before them in convincing manner the knowledge of physiology and heredity, with proper rules for the selection of their partners in life, and such instruction will be gratefully received and in many instances conscientiously acted upon. Right here is where the greatest want will be felt,—namely, the need of proper literature on this subject for such young people. So far as my knowledge goes there are no works extant in the English language which fully answer the required purpose. They are too apt to expound useless generalities, with a seeming fear of telling too much of scientific truth, or going to the other extreme, which is worse, and appealing to sensuality. What is wanted is the unemasculated, scientific truth, given in plain, honest language, so there is no doubt as to its meaning. The nearest to such a book I know of is Alexander Walker's "Intermarriage," or "The Mode in Which, and the Causes Why, Beauty, Health, and Intellect Result from Certain Unions, and Deformity, Disease, and Insanity from

[1] "Influence of Heredity in Producing Disease and Degeneracy. The Remedy."

Others."[1] The gist of their work is the announcement of a law of nature that, when the sexes are in their highest vigor and perfection, "it is the male that predominates in giving the locomotive system, character, and shape, to progeny, and it is preferable that the female should give that system, the vital, which in her is always most developed." Thus, according to this authority we have "two series of organs, on which both life and locomotion respectively depend, in two opposite successions and combinations, variably in beings of the same variety, and invariably both in different varieties (crosses) and when closely and long restricted to one family" (in and in-breeding).

It is not the purpose here to expound the "law of opposites" in the selection of partners in marriage, in order that the best results may accrue in happiness and offspring, nor to explain the many limitations to this law, as when extremes meet in the intermixture of races. (N. B. The lack of resistance to disease in mulattoes and their great susceptibility to consumption). I should, however, consider my essay incomplete if I did not formulate from my own considerable professional experience some *rule of choice* which will help these young people to steer clear of those unions which result in tuberculosis of progeny.

Not to make an effort in this direction would be to do myself and my convictions an injustice, when I attempt to pronounce upon the criminality of those people who will knowingly bring an innocent soul into this hard life handicapped by inherited disease or weaknesses.

Let us throw aronnd the sacred rites of matrimony more safeguards against the pitfalls of entailed suffering, both mental and physical.

Let it be considered, please, that the rule I submit is not only not exactly perfect, but limited in its scope. It is only submitted as better than none at all, and so entitled to allowance for its crudeness and perhaps some credit for its originality.

RULE FOR CHOICE OF PARTNERS TO AVOID CONSUMPTIVE OFFSPRING.

Find the proportion of all the mother's and father's married brothers' and sisters' children born (i. e., the party's parents' uncles' and aunts' children) who were living at five years of age.

1. Then, excluding deaths wholly attributable to accident, or having nothing to do with disease, if less than eighty per cent. of such children were alive at that age, there is reason to suspect a weak strain in that lineage.

2. If less than sixty per cent. of such progeny were then alive, there is strong proof of such degeneration.

3. Add to this, or consider it separately, that either the party's mother or father or any two of his or her grand-parents, uncles, aunts, brothers, or sisters died of consumption, cancer, or scrofula, and the proof of some defective biology in that family strain is still more evident.

4. Add to this the party's health not good, even so little defective as

[1] Lindsay & Blakiston, Philadelphia.

"never very robust," or now flat-chested and underweight, then his or her outlook for matrimoney should be much impaired.

5. Double this tendency to degeneration by uniting two family lineages equivalent to (3) on one side and to (4) on the other of above described limits, and a sin will be committed by such marriage only second to the marriage of a healthy person to an invalid in active tuberculosis, which latter should never be consummated under any circumstances.

If time permitted, many conditions might be mentioned which would intensify the gravity of this reckoning, as for instance, by a strain of insanity, intemperance, or scrofula, existing in progenitors' families, or the concomitant conditions, such as poverty and a climate favoring consumption inseparable from the contracting parties' lives. Of course any rule is arbitrary and may perhaps be favorably modified, as, with the first (1) and second (2) of above classifications, if the grand-parents and parents are living and of good age, or the children born average five or more to the family, or if the possible contracting parties are of opposite temperaments and physiques.

Let Nature through her known laws speak in these warning tones to the young man selecting a partner for life: You may be an Apollo in form, and have an ancestry of centennarians, but you will have great cause for regret if you marry a girl of consumptive lineage who has weak digestion and vital organs; and to the young woman likewise,—you may be a Venus in form, and the loveliest woman in the land, but if you sell yourself to a brute of a man, gross and intemperate, though high in wealth and station, his degeneracy may beget from you an idiot child, or if, through your superabundant sentiment and sympathy, you marry a consumptive invalid you may not only become infected yourself, but you will perpetuate the curse in your offspring, if, unfortunately, you have any.

Considering that the object of matrimony is the begetting of children, it would be a good thing for the state to legally recognize that it is as much a sin for an invalid in advanced consumption to marry as it is for a leper or insane person. As for two tubercular or scrofulous persons marrying each other, it ought to be prevented by law if possible: otherwise it ought to be understood that such tainted unions are not for the purpose of progeny.

Since the law is not allowed to interfere and help solve this problem, the only recourse is *education.* With us in America, this is the saving grace from the universal law of degeneracy. The lower strata are constantly made capable and worthy to take the places made vacant by degeneracy in the upper. The common brotherhood of man, as exemplified in free schools and universal education, is helping to supply the sinew and vitality from the middle and rear ranks which the front rank sadly needs.

Therefore the fostering and perfection of our common, grade, and academic schools are duties which should be dear to the heart of every true

American. To give character, mental force, and healthy bodies, fit for the propagation of a truly noble race, a change in our systems of education is needed. The introduction of physical training and the regular superintendence of the physical condition and habits of scholars, in all grades of schools, should be features in all systems.

The introduction of science teaching early in the course, and the later substitution of proper text-books and teaching of physiology and anatomy, are likewise essential features; and then, either in seminaries or colleges, the maturer mind of the scholar, both male and female, needs to have direction given to all this previous acquirement by books purposely written for them. The object of such literature is to have each scholar train herself or himself to present in her or his own person a "*Mens sana in corpora sano*" embellished by all the beauty, loveliness, and grace for women, and capability, strength, and vigor for men, possible. Finally, the object should be to fit each one to choose wisely her or his mate in life, and to understand the whys and wherefores of this choice. Here is a work for the state, or perhaps for a national body like this association to do, namely, the selection of a proper committee to act as censors of such literature which in turn perhaps might be elicited by proffered rewards commensurate with the skill and knowledge required. The formulation of such a plan, by which this matter can be properly presented to young people before marriage, is an object worthy of this association or any other similar body of men.

Through their state boards of health, the states can do, and are doing, good work in guarding the public health and aiding in the prevention of disease. But, in order that the work there may be united and made more effective, all laws and systems pertaining to the preservation of health ought to be centralized.

Heredity and marriage, so intimately associated with the statistics of disease; infection and contagion; prevention of endemics, epidemics, and food adulteration; quarantine and inland sanitation; the knowledge of climates and seasons; the protection and preservation of life on common carriers, both on land and sea; all are parts of one whole, which ought to be recognized as an independent department of our great government.

The guarding and regulating the health of the people is a national duty, co-equal with the purposes of any of the departments which have gradually been added to constitute, through their representatives, the president's cabinet.

The intelligence of the people and their belief in the importance of the subject of public health, find now timely expression in the popular demand, made by the united medical profession, that a national board of health be established, thus recognized and constituted with its head a cabinet member.

It is hoped that such a representation of the health needs of our people will be one of the crowning features of our government at Washington.

BATHS—THEIR NECESSITY, THEIR INFLUENCE IN ECONOMY, THE DANGERS THEY PRESENT, AND THE MANNER TO PREVENT THEM.

By G. MENDIZABAL, M. D., Delegate from the State of Vera Cruz, Mex.

Cleanliness is, without dispute, the fountain of beauty, as it is also, the the most pure spring of human health.

With only very rudimentary notions of hygiene, man has conceived since the most remote ages, that cleanliness of body renders him more healthy and makes him more agreeable, and in the same proportion as he has advanced in the scale of civilization, he has perfected for himself the means of being so.

We can but consider the importance given to bathing by the Egyptians, Persians, Greeks, and, above all, the Romans. The first act of Eastern hospitality consisted in offering a bath to the traveller seeking the shelter of a roof.

It is suffcient to have visited, or, if not, to have read the descriptions of those magnificent ruins which, by virtue of their extent and equipment, have been recognized as monuments of the first order; of those gigantic Roman ruins known under the names of Termas, Augustus, and Agrippa, of Caracalla, Diocletianus, Titus, and Trajanus, to estimate the degree of prominence given to ablution in that exalted nation whose legions traversed triumphantly the greater part of the then known world.

Unfortunately, civilization, the corruptor of morals, as John Jacob Rousseau says, converted in an evil day those fountains open to all, as well to the high-born as the plebeian; the rich as to the poor; the wise as the ignorant, and from which those people obtained such benefits to health and vitality, into amphitheatres of corruption and iniquity, into centres of depravation and effeminacy, making them abominable in the eyes of men of pure heart and habits who succeeded the vilified race of that abject Roman Empire. These institutions having gone out of use, it was necessary to go slowly again over the same ground and provide the social classes with the most easy and economical means of cleansing their bodies and clothing as well as to preserve them from the thousands of ailments emanating from negligence and indolence.

This is one of the many, and, perhaps, most interesting prepossessions of contemporary hygiene, and the boards of health have not been idle and their gospel has begun to bear fruit. We note with satisfaction the signal rivalry between modern cities in procuring for each inhabitant the greatest possible number of gallons of water, making the precious liquid so cheap as to place the means of cleansing within the reach of even the most destitute of our race.

The task will be long and painful because it is so very difficult to com-

bat filth in low places; but hygiene will triumph eventually, thanks to the tenacity and perseverance with which its advantages are being proclaimed, and with the indifference and indolence of the poor, one of the most active enemies of the blood and destroyers of the constitution will disappear, as well as the gravity and frequency of ailments which the human species has inherited.

It looks as though we have, happily, this great desideratum even in our own days. The large cold water reservoirs in summer and tepid in winter, in addition to shower and steam baths, exemplify forcibly the precepts of hygiene and meet the exactions of economy, seeing that we know the great physiological and therapeutical properties of cold water; how it raises the standard of health, invigorates the most debilitated constitutions and assuages nervous excitement, which produces such considerable functional perturbation. We have found in the cold bath a most excellent corrective for the ephemeral and unnatual existence of the inhabitants of the great centers of population. The shower bath is, in particular, the most tonic because it gives rise to a healthy perspiration very conducive to health. It does not irritate, and one is less exposed to a cold than in the tub, because the duration is very short; the body is more thoroughly cleansed, because all impurities are removed from the skin by the continually new and pure falling water.

It satisfies, also, the demands of economy, because, by this system, many persons can wash themselves simultaneously without any very extra expenditure of water, and because the need of large and expensive plants is avoided.

An easy and true solution to the problem of the hygiene of the skin of the social classes most needing it has been found in the shower bath; such as the laboring man whose mode of earning his bread subjects him to a copious perspiration, such as are collected in diminutive abodes, such as prisoners, soldiers, the afflicted in hospitals, students, and others.

We now find daily innumerable examples of bathing establishments competing for supremacy in the realization of all conditions desired by a cultured public.

Public baths have reached the highest stage of perfection in Germany, Austria, and England, and these countries have produced in the last fifteen years the largest number of scientific works on the subject.

The city of Berlin, above all, shows with pride to travellers her bathing department in the barracks of the Grenadier guards, wherein three hundred soldiers can bathe themselves hourly, each consuming only from ten to fifteen litres of water.

In our country, we have been working, unceasingly, in the last few years in augmenting the volume and bettering the quality of the water supplied to our cities, and in every direction public bathing establishments are on the increase.

The City of Mexico, which had hitherto only had a supply of from

sixty-fifty to seventy litres of water per inhabitant, will double this allowance in a short time, and will augment the number of modern bathing centres where prices will range to suit every pocket.

The government is now constructing a bath house in Lagunillas Square, applying to the object a private donation, in which the poor will find shower, and hot, and cold baths with the further privilege of having their soiled linen washed while they are on the premises.

We anticipate that this praiseworthy effort will impel our philanthropists to greater deeds and that such a laudable example will soon be copied by the authorities of the other states of our Union.

Cold immersion and shower baths are every day becoming more general, but the warm baths will be yet a long while preferred by the public, and as in these, in virtue of the principle on which they are established, there is considerable risk, it is imperative to take such steps as contemporary hygiene urgently calls for.

How many diseases can be caught and are, in fact, being taken in badly kept and imperfectly cleansed tubs, through the use of sheets, towels, combs, brushes, etc., which are not only not disinfected, but are not even kept in a respectable condition.

Four well proven cases, which it would have been impossible to have brought to light in a large centre of population, came under my personal observation in Orizaba, a city of thirty thousand inhabitants, in which I practised several years.

One was that of a healthy and robust child, without a taint of hereditary disease, to whom a scratch in the leg has brought a hard chancre, which developed by a succession of accidents into constitutional syphilis. An individual I was treating for a chancre had just made use of the same bath tub.

I have seen two young men who had taken scarlet-fever in a bath that had just been left by an individual recovering from this disease, and who was then losing his skin; and, lastly, I have seen a wound in the face, nearly cicatrized, develop into erysipelas, putting the patient's life in great danger, and who took that sickness in a bath which some hours before had been occupied by a man who was convalescing from erysipelas in the leg.

These few cases or examples, casually investigated, make us contemplate seriously, to how many risks we are exposed in baths under the conditions in which they are at present conducted.

Indeed, in many of them cleanliness is much to be desired, but even in those which are most recommended through the careful attention they receive and cleanliness observed how many germs of infection or parasites can be waiting for their future victim, concealed in the folds of the whitest bed-sheet, or towel, or in the depths of, apparently, the most pure and transparent water?

It must be admitted that brushes, scissors, and all kinds of instruments

furnished by these establishments can be vehicles carrying perilous germs if they have not been carefully washed or disinfected to guarantee their non-inoculation and cleanliness.

From these remarks, though very brief, as this lecture must not exceed the time limit fixed in the rules governing this conference, it is to be deduced that scientific bodies which have the noble and high mission of watching over the public health, are bound to dictate such precautions as are in keeping with up-to-date medical knowledge, protecting alike health and life in such imminent danger of being sacrificed in a bath.

Taking into consideration the alarm, which I think very justifiable, the boards of health should study and adopt the remedies they judge most efficacious and convenient.

I permit myself to suggest, as being most advisable, the compulsory cleansing of bath tubs with a disinfectant soap having no disagreeable smells, such, for example, as cyanide of mercury, and order the boiling of the bed-sheets and towels after each bath, and, if possible, each establishment should possess a disinfecting stove through which the linen and all articles used should pass before being again put into use.

Cleanliness, as I said at the beginning, is the fountain of beauty as it is the source of health, and *aseptia* and *antiseptia* promise us, in all their forms, to liberate us, more or less briefly, from many infections and parasitical ills to which the lives of men are perpetually exposed, and, fortunately, modern science has discovered already many palliatives and the rest is only a question of time. We have now to abbreviate the term and we shall have rendered a true and lasting benefit to humanity.

NECESSITY AND DESIRABILITY OF POPULARIZING THE STUDY OF HYGIENE.

By Dr. ADRIAN DE GARAY, of Mexico.

The preservation and perfection of health, with the consequent prolongation of human life, are the most important benefits that can be received by a man or a nation. A sick man is a being who suffers, and who does not work but consumes; he constitutes a capital withdrawn from circulation, whilst the family and the nation have just so many hands less employed in their service. When the individual dies his work also dies with him as well as the personal capital which he represented.

The life of a man, therefore, represents a certain wealth for his country and family, whether considered from a social or an economical point of view. Hygiene is the science that studies the preservation and prolongation of human life, and as there is nothing more precious than this, no study can be more important than that of hygiene. This science cares for man even before he is born, and whilst he is still within the uterine cloister, and it follows him all through the vicissitudes of life like a guardian angel, protecting him in his infancy, giving him strength on reaching maturity, and shielding him during his old age. It shows us on what soil we ought to live, the air that we ought to breathe, the manner in which we ought to build our dwellings and arrange our dress; teaches us the classes of waters that are not fatal to health, tries to drive us with horror from the abuse of alcohol, provides us the food for which we are adapted, cares for our senses, strengthens our intelligence and gives courage to our hearts, refusing to admit vicious habits, whilst it also inculcates morality. It drives us from the sources of contagion, gives health and happiness to the communities and abandons neither the rich nor the poor, neither the soldier nor the sailor, neither the workman nor the learned man, and extends its protection to the sick man in his sufferings and the prisoner in his loneliness. Rising to a higher sphere of action, it tends to improve the races and families, it advances agriculture and by means of a healthy morality and the propagation of order, justice, and progress, it tends to the prevention of war and the extermination of the human race. For this reason we can say with an authorized writer, that hygiene includes everything that tends to the happiness of mankind.

Hygiene is a science, that utilizes for its purposes, the advancement of all the sciences and of nearly all the arts. When physics, chemistry, natural history, astronomy, medicine, and engineering were yet in their infancy, the precepts of hygiene were considered vulgar, ridiculous, and many of them even injurious. Every step forward in the sciences is another

advance in hygiene, which must not be looked upon exclusively in the same manner as it is considered by ignorant people, as the instinct of self-preservation, but as a scientific art which renders enormous services to humanity in general.

The times have gone by in which epidemics were considered as a punishment from Heaven, when people were prohibited from struggling against them, and the clergy pretended to drive them off by means of processions and prayers in the churches. To-day, thanks principally to Pasteur and Koch, we can very often specify the exact origin of the contagion, and we can prevent the deaths of thousands of men by simple vaccination, for example, and the isolation of the enemy. A few years ago, a cholera epidemic invaded Europe, and with great pomp visited the Bay of New York; but hygiene went out to meet it and closed against it the gates of America, and thanks to the precautions then taken, many of us are now enjoying life.

Hygiene is, therefore, the science of health and of life, and the men who are healthy, vigorous, and intelligent are those who form the cultured and powerful nations. With the progress of science and of the arts in general, and with the creation of the bacteriological science by Pasteur, the eminent genius whose death we now deplore, hygiene has made great advances, that is to say, millions of men have been saved from death and their health improved.

To the woman in pregnancy, to the child, to the man, to the aged in all conditions of life, and whatever may be their position or profession, hygiene renders a powerful assistance, as it also renders to the governments in all matters which relate to the health or collective welfare of mankind.

But however important and useful a matter of this class may be, it cannot be put into practice without being understood, and there are numbers of persons who do not comply with the rules of hygiene because they do not know them, or because they have formed mistaken opinions on the subject. The first thing is to live and afterwards comes the manner of living, and as hygiene teaches us the way to preserve and improve our health, its study ought to be preferred above all others.

If hygiene ought only to be understood by the physician it would be of very little service to humanity. We physicians are called in, not to ask us advice as to the way to prevent disease, but to cure it when it is already existent. The utility of hygiene consists in its being extensively understood. It is of very little use for the governments to enact sanitary codes if these are neither comprehended nor listened to, and still less obeyed. Besides this it is impossible to exercise strict vigilance over the fulfillment of sanitary laws; they can be easily avoided, and such laws are not even read by the vulgar and perhaps not even by educated people. The law has no force in the interior of the home, but what has some force is good advice and friendly persuasion. Neither is it enough to know a law; it is necessary to understand it, as we can then appreciate

all its value and live up to its provisions. From all this we can understand the necessity and advisability of extending the knowledge of hygiene to all social classes. The manner of attaining this important object, is what I propose to treat of in this article, the intention of which is strictly practical, and in accordance with the objects of this illustrious body.

To the governments pertains the duty of undertaking the principal part in this matter. It is necessary to teach the science of hygiene in every way that is found possible, to the children, to men, to women, and to aged people; to the soldier, to the sailor, the artisan, the cook, and the prostitute. This instruction ought to be given by means of books, periodicals, museums, conferences, public speeches, and public schools.

The practice of hygiene ought to be obligatory in all educational establishments. Children ought to be taught to read in books of hygiene which treat the subject in an easy, varied, and pleasant manner. The science might also be taught in its different branches, by the use of small models, toys, and object lessons. These models might represent closets, sewers, houses, stoves, cess-pools, desks, etc. The walls of the school ought to be ornamented with pictures relating to objects of this character and with short texts on hygiene. Prizes could be give to the cleanest and neatest children and to those who best comply with the duties of school hygiene. From the age of seven to fifteen years, the children ought to be taught hygiene by means of charts and diagrams as well as in the form of precepts, so that the instruction should be as far as possible of an objective and practical character. In the secondary stage of education, from fifteen to twenty years, the knowledge of hygiene might be imparted in a more exact manner, and if possible, the pupil ought previously to be instructed in the elements of anatomy, physiology, physics, chemistry, and natural history. Cabinets should be prepared with a full supply of models, and the pupils instructed to classify different waters and foods. These subjects ought all to form part of the examinations and valuable prizes be given the pupils in order to stimulate them in their studies. In the schools of arts and trades for men and women, similar courses ought to be established and perhaps on a higher scale; but especially with reference to everything connected with hygiene in the different industries or factories, accompanied with practical lessons, in which the professor would take his pupils to visit certain industrial establishments. Special classes ought to be established for girls, in which they would be instructed in a proper and adequate manner on the points of hygiene that particularly relate to womankind. Hygiene ought also to be taught in all the superior schools, such as the commercial, fine arts, agricultural, and veterinary schools, as well as the special ones for lawyers and engineers. The veterinary surgeons fulfil an important mission in questions of hygiene; the lawyers ought to be well instructed in sanitary legislation, and the sanitary engineer is called upon to take an active part in the most important questions connected with public health. The schools of medicine would naturally establish complete courses of hygiene, whilst these subjects would

also form part of the curriculum for mid-wives, pharmacists, and dentists, although it might perhaps not be necessary for them to study these questions with all the depth that is required of physicians. In the orphanages and asylums lectures ought to be given on this important subject as well as in the Roman Catholic seminaries and schools, and as far as possible, they even ought to be preached in the pulpit. It must be borne in mind, that hygiene not only refers to material subjects, but also to social and moral customs, and that the strict observance of its laws forms the basis of all virtues.

In this scientific, reforming, and beneficent campaign, we must not overlook the laborer and adult artisan of whatever condition or sex. These unfortunate people work the whole day long with the object of earning the bread for their children by the sweat of their brows, and when they leave their homes they ignorantly leave their children to suck the breast of a tuberculous woman: to carry the contagion of diphtheria to their brothers and sisters; they feed them with food not adapted to their age; or they live in crowded tenements to die from infectious diseases or to grow up sickly and a misery to themselves and their neighbors. Parents who are themselves the victims of alcoholism and syphilis, unknowingly bequeath to their children the seeds of epilepsy, of crime, of degenerated blood, and of misery. It is urgently necessary that hygiene should penetrate the dwellings of these poor, should take the cataracts of ignorance out of their eyes, and aided by the light of science and truth should show them the way to health and virtue. For the enlightenment of these people who are abandoned by Fortune I would propose nightly lectures on hygiene, pronounced in an easy, pleasant, and popular style of language. Lectures might also be given to the attendants in the hospitals, and to the nurses of the infant hospitals. All these labors for the popularization of hygiene ought to include instruction on the sanitary legislation of the country so that the hearers should be able to comply with its provisions.

The governments ought to propagate the knowledge of hygiene by means of periodicals, which would be organized and sustained by themselves and edited by competent persons. This undertaking would probably not return any positive profits, but nevertheless the periodicals ought to be distributed gratis and with the greatest profusion. They ought to be written in a familar style as well as be pleasant to read, and especially they ought to avoid the use of technicisms. When possible or desirable, they ought to be illustrated, and in order to make them more interesting they ought to contain articles on history, literature, music, useful knowledge, and general politics. The type ought to be large and easy to read.

It would also be desirable that in all establishments which are largely attended by the public, cards should be affixed to the walls, clearly printed and setting forth the rules of hygiene which ought to be there observed. We specially refer to such buildings as churches, prisons, barracks, theatres, mines, mints, schools, work-shops, hospitals, bath-houses, barber-shops, slaughter-houses, etc. By putting into execution the above ideas,

which are really very practicable, we will be able to popularize the knowledge of hygiene, the only means of improving the condition of the people. We can never require our children to speak the beautiful language of Shakespeare and Washington, if we only teach them Spanish. If we oblige them to study the language in the proper way, and with grammar in hand, they will in time be able to speak English correctly.

There are innumerable beings who suffer and die through their ignorance of hygiene. They die of thirst whilst this Association forms an immense ocean of pure water, consisting of a wise knowledge and years of experience, which waters could be used to slake that thirst and save many lives. I urge upon you to open a sluice gate and let out some of those life-saving waters, which will rush out forming cascades and torrents, rivers and small streams, spreading out over the world and giving to the poor the health, happiness, and welfare which they stand in such great need of.

SMALL-POX IN WISCONSIN FROM JANUARY, 1894, TO JUNE, 1895.

By U. O. B. WINGATE, M. D., Milwaukee,
Secretary Wisconsin State Board of Health.

The state of Wisconsin has an average length of about 260 miles, breadth 215 miles, and an area of 56,000 square miles, or 35,840,000 square acres. In other words, its territory is nearly equal to that of England and Wales together. The highest elevations are about 1,800 feet above the level of the sea, and the lowest 600 feet. It is divided into 70 counties, and has a total population, according to the census of 1895, of nearly 2,000,000. It has one city of about 250,000 population, and a total of 1,235 cities, villages, and towns, out of which number there are 48 cities with a population ranging from 25,000 to 4,000 respectively. Each city, village, and township is required by law to have an organized local board of health, consisting of a chairman, a secretary, and a health officer who is the executive officer of the board. There are a few townships, in the sparsely populated districts, that have not conformed to the requirements of the law. There are, however, about 1,175 legally organized local boards of health in the state.

Prior to 1894, small-pox had not existed in the state for a number of years, with the exception of now and then a sporadic case. At the beginning of 1894, the disease prevailed extensively in New York, Pennsylvania, Indiana, Ohio, Illinois, and some other states, and was showing an alarming increase in the city of Chicago, Ill. During the month of January, 1894, three cases occurred in the state—one in the city of Milwaukee, the metropolis of the state, one in Janesville, Rock county, and one in Juneau, Dodge county. The disease did not seem to spread from these cases, but soon after it began to appear in different places in the state. In some instances it could be traced directly to Chicago, in other instances it was impossible to trace its origin.

The state board of health, in session, this month adopted its vaccination rule, which required that no child could be admitted to school without presenting a certificate of successful vaccination. This rule was of general application throughout the state. It also urged vaccination of all teachers, inmates, and employés of all institutions, factories, etc. There was, however, a very active anti-vaccination society at work in the city of Milwaukee, and its influence spread more or less over certain portions of the state, but subsequent reports showed that the rule was very generally observed throughout the state, and especially in those localities where the disease made its appearance.

The disease increased and reached its height in the state about the middle of October, 1894, when it began to decline, and entirely disap-

peared in the month of June, 1895. It appeared in thirty out of the seventy counties, and in fifty-eight places. The total number of cases and deaths is as follows:

County.	Cases.	Deaths.
Brown	31	8
Chippewa	1	0
Columbia	1	1
Crawford	1	0
Dane	2	1
Dodge	5	3
Douglas	2	1
Eau Claire	1	0
Fond du Lac	5	1
Grant	1	0
Green	5	2
Jefferson	3	1
Juneau	8	0
Kenosha	1	0
La Crosse	1	0
Manitowoc	45	11
Marathon	14	4
Milwaukee	1,197	299
Monroe	6	0
Oneida	3	1
Outagamic	12	2
Ozaukee	7	0
Pierce	1	0
Portage	3	0
Racine	9	0
Rock	3	1
Sauk	4	1
Sheboygan	4	1
Walworth	5	1
Waukesha	9	5
Winnebago	22	8
Total	1,412	352

The total death rate in the state was 24.92 per cent.

Outside the city of Milwaukee, the only data obtained was the number of cases and number of deaths. Other important data, relating to whether cases were treated at home, or in hospital, and the vaccination history, were impossible to obtain. In the city of Milwaukee, however, the data are more complete. There were 1,060 cases with 271 deaths, giving a death rate of 25.56 per cent. Out of this number 575 cases were treated in the hospital with 134 deaths, giving a death rate of 22.53 per cent. Four hundred and

eighty-five cases were treated in homes with 137 deaths, giving a death rate of 28.25 per cent. Out of the 1,060 cases, a history of vaccination was obtained in 1,016, 343 of which gave a history, or presented evidence of vaccination some time prior to the attack; of this number 35 died, or 10.21 per cent. Six hundred and seventy-three cases gave a history of having never been vaccinated. Of this number 191 died, or 28.38 per cent. In 44 instances, where cases were treated at home, no history of vaccination was obtained.

It will be observed by the foregoing record of the disease, as it appeared in different counties in the state, that in the majority of instances it was not allowed to extend to any great extent. In several instances it was promptly stamped out by the local authorities, and a second focus of infection introduced after several weeks or months, again to be promptly stamped out.

The state laws, relating to contagious diseases, in Wisconsin, are ample and sufficient, if properly enforced by the local health authorities, to control any outbreak, and in the great majority of instances, public sentiment sustains the law. The greatest difficulty that was encountered, in enforcing the law, was in the city of Milwaukee, where the public sentiment, in certain quarters of the city, did not seem to be sufficient to sustain the local health authorities to the extent necessary for prompt control of the outbreak, and we see by the figures the result. It was evident, at the beginning of the trouble, that a large mass of the people, residing in the locality where the disease appeared and was most prevalent, did not appreciate the value of sanitary law and its enforcement. As a result of this, when the local health officers attempted to enforce the law, riots occurred, and the disease was spread unnecessarily in a great many instances. The report of this outbreak and the riotous demonstrations that occurred, is already a matter of history, and has been fully recorded in the biennial report of the state board of health of 1893–'94, and needs no further comments.

There are some practical questions that have made decided impressions on the mind of the writer, connected with the history of this outbreak, to which perhaps it will not be out of place, at this time, to briefly refer.

In the first place, the writer believes that small-pox will probably always exist from time to time. It makes no difference how stringent the laws may be relating to such matters, they can never be enforced until experience teaches the masses of the people their importance. I say experience, for it must be evident to all who think and have had experience, that there are always to be found many persons in every community who can never learn,—will not learn—that fire will burn them even, until they get burned. Vaccination is, undoubtedly, the great preventive of small-pox, but in order to be effective every one knows, who is versed in the subject, that it must be repeated sufficiently often to keep the system immuned from the disease, and until that time comes, when every person will take it upon himself to be re-vaccinated every few years, on the same principle

that he would have a fire or life insurance policy renewed when it runs out, we can never expect to be absolutely protected from small-pox. It is well known that some persons, vaccinated in infancy, may remain immuned for a life-time, while with others, immunity will only last a few years, and the only safety is in oft-repeated vaccinations, certainly as often as every five years. One never is quite sure, however, when the immunity ceases to exist, and no one should run the risk of exposure to small-pox without being vaccinated certainly within two days after exposure, unless he has been successfully vaccinated within a year prior to the exposure. Physicians do not recognize the importance of this as they should, and we have had an impressive illustration of this in the outbreak I have herewith related. One hospital in Milwaukee contained about fifty cases of small-pox at one time. In company with my friend, Dr. Hewitt, secretary of the Minnesota State Board of Health, I had visited it and remained some time, going through the entire institution, and examining all the cases—other physicians did the same,—and although we supposed we were immuned by vaccination, we would not risk it, but were re-vaccinated soon after making our visit. A little later, two members of our state board, both excellent physicians, paid the hospital a visit—thought they were immuned by successful vaccination of several years ago, so were not re-vaccinated, and both went home, in the interior of the state, and in due time both, to their great chagrin and detriment, came down with small-pox.

Another point of great interest, in relation to this matter, is the propagation of pure vaccine lymph, and until this can be absolutely under the control of the state, or national government, and entirely taken out of the hands of commercial interests, we can never expect to always have absolutely pure material furnished. Whenever an epidemic, or an outbreak of small-pox occurs, there is always great difficulty in procuring pure virus, and it is no wonder that the people, or quite a proportion of them, oppose vaccination on the ground of impure and unreliable vaccine. In my judgment, this can never be remedied until the government, or state, takes it in charge, and I believe this is also true of the antitoxins and similar products used for immunizing purposes. Successful vaccination with pure, effective vaccine and isolation of cases, are the two great weapons upon which we must rely to control outbreaks of small-pox—and to carry these two means into effect, we must have both law and education.

There is a class of people, and probably will always be, who must have the strong arm of the law behind them to compel them to do that which is for their best good. There is another class which fortunately, I believe, is increasing in numbers, who do not need law but with whom reason will be sufficient in all cases of emergency.

All statistics, with which I am acquainted, correspond with the few figures that are given in this paper, relative to the advantages of treating cases of small-pox in isolation hospitals rather than treating them at home. The death rate of cases treated in properly constructed and prop-

erly managed isolation hospitals is decidedly less than of those cases treated in homes, even under the best circumstances, and this can be readily understood by any physician of experience. But this is not all. Every health officer knows that in the great majority of instances, in cities especially, cases of this disease cannot be properly isolated at home without danger to the public. Here again we require very strong laws, and a great deal of educational work, to control the two classes of people with whom we have to contend when this disease makes its appearance. People must be taught the advantages, not only to themselves, but to their neighbors, of being removed to isolation hospitals for treatment. Those who cannot be taught must be dealt with by a law which will compel them to do that which is best for themselves and the community in which they live.

Another great work to be done, it seems to the writer, is to educate communities up to the importance of appropriating a sufficient amount of money to erect and maintain, in every city and village, suitable hospitals which should be in every way so well equipped that no complaint can be brought against them, and which should be so maintained, at public expense, that the comforts enjoyed therein, by patients ill with contagious diseases, are equal to, or greater than, those enjoyed in the majority of homes.

By such provisions, epidemics of small-pox can be easily controlled, and not only life and health saved, but the enormous expense to every community, which necessarily occurs, in which any extended outbreak of this disease exists.

SOME REMARKS AS TO ABORTIONS AND STILL BIRTHS, AND THEIR RELATION TO HYGIENE.

By Dr. MANUEL GUTIERREZ ZAVALA,

Professor of Obstetrics in the National School of Medicine of Mexico.

Mr. President and Gentlemen,—Nobody can doubt that all the causes which are capable of producing an increase in the mortality or a diminution in the birth-rate of a country, constitute the most powerful and terrible feature of its physical decadence, and are interpreted in the most eloquent manner by an evident decrease in the mass of the population.

And if this is so, what must necessarily happen when the causes above mentioned determine at the same time, a greater number of deaths and a lower number of births in any given locality? It is easy to foresee the consequences if we only enumerate the antecedents. And let it not be believed that this is a mere theoretical supposition; the experience and statistics of years clearly show us that the fact exists, and in a special manner throw light upon the question of premature and still births, with respect to which I would now call the attention and beg the interest of this assembly.

It is only necessary to take a glance at the tables of general mortality, to be convinced that they show in a collective and isolated manner as well, the important number of those beings to whom it was not granted to see the light. It is true that amongst the cases I refer to, there are some which cannot properly come under the question of hygiene, on account of their accidental character; but the majority of them are included in that subject and imperiously demand the consideration of its students.

This cause for popular decrease pertains to all countries and to all epochs.

In the capital of the Mexican republic with a census of approximately 327,000 inhabitants, during the period of four years and a half which commenced in January, 1891, and terminated with the first half year of 1895, the Registry shows 2,181 abortions and 1,754 still births, which are divided as follows:

Year.	Abortions.	Still births.
1891	351	584
1892	556	450
1893	514	409
1894	517	197
1895	343	114

making a total of 3,935 individuals less in that exceedingly short space of time.

If from this result we proceed to an investigation of the causes, we find that they are intimately connected with important questions of public and private hygiene. The marriages between blood relations, those between persons of very early or advanced age, or those who are afflicted with some grave nervous affection such as epilepsy, constitute the beginning of that ladder which with very great frequency leads to results like those just enumerated.

In the meetings of the scientific societies which have been lately held in Mexico, Dr. Olvera has called attention, from another point of view, to the desirability of preventing the marriage of epileptics, and I believe that both in this particular case as in others which I have already indicated, the law and hygiene ought to work together to prevent or at least greatly restrict such marriages. Alcoholism is another serious evil that exercises a great influence on the home. Not only does the poor nutrition of a woman addicted to alcohol, or suffering from dyspepsia, want of appetite, and other organic and functional disorders induced by the abuse of liquor, prepare the road to a faulty development of the unborn child; not only does the blood which is charged with a toxical agent, which in its course through the viscera carries with it other evils such as anaemia and fatty degeneration, have the same effect on the vessels and other organs which serve as a connecting link between the mother and child; but the very physical and moral condition of the persons who contract this pernicious habit, deprives them of the opportunities of exercising those precautions in order to obtain the successful termination of the period of pregnancy.

Everything, therefore, which tends to restrict the abuse of alcohol, constitutes a wise and desirable prophylactic means against premature or still births.

In the same category as alcoholism and equally prejudicial, is that unhappy and dangerous condition, that turns a human being into a simple automaton, the morphine habit. This vice, for which the fair sex appears to have a special predilection, is worthy of the same reprobation as the one I have already mentioned, viewed from the point taken in this paper. It is really remarkable to see the great number of cases of morphine habit that are observed by the practising physician, and especially if we consider that the sale of this narcotic is prohibited except for medicinal use. Consequently, either the physician (a thing which I do not believe) prescribes this alcaloid, when he ought not to do so, or the patient takes advantage of somebody else's prescription in order to procure it, or more probably still, he is furnished with all he desires in some wholesale or retail drug store without any order from the physician.

Let this be how it will, and from whatever point of view we consider the question, it is of so grave a character, whether speaking socially or hygienically, that no precaution can be excessive, and no slight penalty can be considered sufficient, in combating a disease whose remedy is in the hands

of the legislator and the physician, and the absence of which is really shameful to humanity.

Much more difficult and delicate is the question when we treat of tuberculosis, the action of which, whether it is general on the constitution of the individual or localized in the reproductive organs, exercises a most powerful influence on the propagation of the species.

Many and complicated are the questions which are connected with the development of the neoplastic misery, as it was called by Virchow; heredity, innate or acquired predisposition, atmospheric contagion, contagion by the digestive channels, by conjugal relations, etc., but however numerous they may be, they cannot and ought not to be outside of the province of the student of hygiene, the only one who has in his hands the power to prevent such desolating disease.

All that has been done or that in future may be done by way of sanitary measures against tuberculosis, will not limit its benefits to the persons who show a predisposition to contract the disease or who may already have contracted it; but they must be extended also to the descendants of such persons.

Fortunately we can say, that, day by day, hygiene discovers new resources with which to overcome many infectious diseases in their birth, and to modify in a notable manner the progress of others, reducing the effects of the propagation, and thus indirectly obtaining a fresh benefit, as we well know the unfavorable influences which all diseases of this character, such as typhus, la grippe, cholera, etc., have on the life and health of the fœtus.

It is also within the province of hygiene, to study everything referring to the profession, and occupations of womankind; unfortunately finding itself in many cases obliged to struggle against opposing interests, such as those of health and the necessities of life. Innumerable premature or still births proceed directly from the deprivation of pure air or sunlight in the dwelling or workshop. How many others do we find due to the inconvenient postures or movements of specific parts of the body?

This question is as vast as it is interesting and it is difficult to present to your consideration all the important points related with it; but I cannot neglect the opportunity of calling your attention to two mechanical devices, the use of which has been generalized to a great extent and which are employed as a means of subsistence or convenience, in the first case, and as a means of transport or recreation in the other; I speak of the sewing machine and the bicycle.

It is well known, that if in both of these machines the movement is imparted by the inferior members, the effects of such movement will be felt in the pelvis, giving rise to congestions, inflammations, and other disorders of the organs which it contains, and if to this we add the inconvenient and prolonged position, the exclusive use of a specific set of muscles and the fatigue which naturally results therefrom, we cannot wonder if we find in them the beginnings of a real disaster, the premature

confinement of the pregnant woman, gynecological diseases in the one who is not, but who later on may be, and with probably the same results.

The sewing machine already furnishes the means of living to a great number of women, and it therefore becomes necessary to study some method of moving that machine with a slight cost but without the assistance of the worker, leaving her to receive the profit of the work without incurring the danger accompanying its movement.

With respect to the bicycle, let it be used if you will, but I suggest that it be reserved to the use of the stronger sex.

I should very much prefer to leave on one side a phase in this question which presents great difficulty, but I cannot attain the object of my paper without treating of that subject; I refer to the uses of substances or the practice of abortion. It appears impossible that not only the woman who carries in her womb the fruit of an illicit connection, or the lover who has brought her to that condition, should be accomplices in the commission of a crime whose object is to cover a fault, but that, even though it should be in exceptional cases, physicians or mid-wives should become accomplices or principals in such a nefarious transaction. Only by the imposition of the most severe penalties and by the strict application of them, let the criminal be who he will, can this source of mortality be corrected, a source which is unknown to the statistical offices, but which is a serious cause of the decrease of population.

And finally, the crowning point of the question under study, is found in that social cancer which is called syphilis, which always has and always will figure in every table of mortality which treats of premature or still births.

As we see, this question and all the others which I have had the honor to bring to your attention, are in themselves susceptible of enormous development, and of complicated studies which could not be included within the limits of this imperfect sketch, and do not even properly pertain to it. For this reason it is, that after having superficially indicated them, I desire to propose to this assembly, that if it is considered advisable, a committee should be appointed to undertake the study of the best means obtainable to diminish the number of abortions and still births; such committee presenting a report at the next meeting of the Association.

THE NECESSITY OF ESTABLISHING SANITARIUMS FOR TREATING YOUNG LADIES AFFLICTED WITH CHLOROSIS. THEY WOULD BE THE BEST PROPHYLACTIC MEANS AGAINST TUBERCULOSIS IN PARTICULAR, AND CONSTITUTIONAL DISEASES IN GENERAL.

By J. E. MONJARAS, M. D., San Luis Potosi, Mex.

The numerous organic diseases which are found designated in all treatises on pathology cannot always be considered as disorders located in this or that organ, but must in most cases be regarded as the result of general primary disorders which eventually modify the constitution of the organs, thus preventing the perfect fulfillment of that double molecular movement in the protoplastic organ which, as Brouchard has said, is nothing but life with its double movement of assimilation and disassimilation, viz., creation and destruction. It is thus that the great conception anatomo-pathological of Virchow becomes a reality which places in the anatomic element the origin of morbus processes. The result of these alterations or at least the immediate reason for them, depends, no doubt, upon the powerful influence of the nervous system, though the intimate process is as yet unknown in the great majority of concrete cases.

But they should be immediately attributed to the great irrigation system of the nourishing juices, so that it depends on both systems to maintain the indispensable condition for the life of each cell, which consists precisely in the constant and determined relation of these elements among themselves.

The nervous system regulates this essential condition for the life of the individual element, and for that of the organism in general; it belongs to the blood system, controlled by this regulating function, to effect the double action, or nourishing and purifying continually the general organism. But however powerful the effects produced on the organism by the perturbation of the nervous system may be, considered from a physiological point of view, in pathology, nevertheless, its influence is more restricted; just the reverse of what happens in the perturbation of the blood system.

Although important, the diseases produced by the normal presence of pathogenic organisms in the blood, their limited number and the fact that their principal importance lies in organic weakness, which increases the receptivity, still more important is the study of the diseases caused by the alterations of the figurative elements of the blood, because of their abnormal increase or diminution; these produce the principal disorders which the physician encounters at every step when he carefully analyzes the composition of that important liquid, the blood; these alterations produce the various kinds of anemia which doubtless are the starting

point of numerous disorders which jeopardize life at every step, and which, when treated at the beginning, can be easily remedied.

If, for example, we analyze the blood of patients afflicted with an acute phlegmonous affection, pneumonia for instance, we invariably encounter certain traces which will be sufficient to furnish us with the diagnosis of the disease, and to indicate to us the result of the treatment adopted to overcome it. The same will happen with regard to the group of the piretic diseases and more especially with regard to that known by the name of clorosis. In this group the data furnished by the condition of the blood, more notable because of their simplicity, clearness, and great significance, are the principal points by which the physician can obtain a useful and truly scientific result. It will be observed, moreover, that whatever may be the origin of the disease, its form and its progress, these traces always exist and are the most certain guides for the expert or practical physician. Among the diseases produced by the modification in the formation and evolution of the elements of the blood, those which relate to quantitative and qualitative modifications of the white and red globules, in a word, chlorosis, will be those whose study claims our attention in order to draw from it consequences of great significance for the pathogenia and prophylactic of this group of diseases, which, though small should, on account of its importance, claim the attention of all observers.

Almost all physicians who have given special attention to the study of tuberculosis have been surprised to find their patients afflicted with anemia. But in this relation between tuberculosis and anemia, which of the two diseases is conducive to the other? Is it tuberculosis as Hyam would have it, that which is the occasional cause of certain kinds of chlorosis, or is it chlorosis which tends to produce this and many other diseases? I am inclined to accept this latter hypothesis which, founded upon what we have already stated in regard to the influence of the general process founded on the localized organic ones, that is to say, that with the exception of traumatic diseases of the organs, there is reason to believe that the rest have had their origin in the proto-plasmatic ones, caused by the irregularity of the distribution of the nourishing juices, and because it has been demonstrated that all affections which favor enervation, favor also receptivity. The study of the etiology of the different chlorosis in young ladies demonstrates quite clearly that the determining causes represent in the same a very insignificant or at least not very clear part. It is not so in regard to predisposing causes, which seem to have a preponderating influence, and for this reason the etiological study shows clearly the cause of the constitutional propensity without which the disease cannot manifest itself, as Hyam maintains. The predisposing causes represent also at times the part of the determining causes; among the most prominent being the bad hygienic conditions of living, mainly in the period of puberty. How few young ladies pass through this critical period without giving a sad cause for the disease or even for death! But just as the influence of the bad hygienic conditions in chlorosis, produces the serious

consequences which we have pointed out, so also will good hygienic conditions give a most wonderful result when timely applied, rescuing a great many victims from death. The vulgarization of this knowledge though it may seem easy at first sight, is in fact exceedingly difficult in its strict application for a determined period, and hence the necessity of establishing sanitariums where, besides the necessary comfort and instruction, the best possible method against chlorosis may be followed; that is to say, that besides a proper administration of medicine, suitable hygienic-dietetic treatment should also be observed, which consists in the most liberal use of pure air, healthy and suitable food, exercise and gymnasium taken methodically in the open air, proper care of the skin, baths, douche, and similar practices; in short, the best conditions for the whole system to acquire sufficient strength to conquer in the struggle, repairing the disorders suffered and destroying or nullifying the action of the micro-organisms, which find ample and fertile fields for their development in the state brought about by such disorders.

Of what use is it in fact for these sick young ladies to take this or that medicine, to attend this or that dispensary, if the hygienic conditions in which they live are more or less bad? It is a useless expense, the one incurred in medicines applied without any coöperating influence; it is useless to take such medicines if the nourishing elements are insufficient or of bad quality. The board of health and public hospitals would do a much more useful work providing the good hygienic conditions of which I have just spoken, and would save the expense of the medicine whose action would be nullified when administered to persons who are victims of pauperism.

Let the sanitariums to which I have already alluded remedy these sad conditions and a great many victims will be rescued from anemia and a great many from chlorosis which not only can kill the persons afflicted by it, but also he who in good environment receives the germs which the disease throws off.

The greatest obstacle met with in the successful carrying out of these institutions is the aversion which most people have for seclusion, and also the financial question; in order to overcome the first it is necessary to remove from said institutions anything which tends to identify them with the hospitals, and to provide them with comforts and such features as are characteristic of bathing resorts. To overcome the second it is necessary to make a move in their favor and see to it that such associations as ours recommend them; to appoint committees to make generally known their great advantages and to contribute to their establishment.

Consequently I had the honor to propose to this honorable society the following:

1. To ask a vote in favor of carrying out the idea of establishing sanitariums for chlorosis.

2. To appoint, from among its members, a committee who shall report the best means to accomplish this end.

THE PART WHICH PAUPERISM PLAYS IN CITIES.—ITS EXTINCTION IS THE BEST PROPHYLACTIC MEANS AGAINST TYPHUS.

By J. E. MONJARAS, M. D., San Luis Potosi, Mex.

The perfect functions of an organism can never be fulfilled if some of its components, or an important group of what we might call the unities of its mechanism, does not contribute that part of activity which is necessary to maintain the harmony which must exist in such organism; and if the functions of these organs are not fulfilled with regularity, could it reach in its development the degree of perfection of which it would be capable, when all and each of its details, and all and each of the parts which constitute it do not contribute with their corresponding activity?

Could human organism reach the development of which it is capable without proper coherence and without the efficient coöperation of the parts which compose it?

The nourishing functions are interrupted simply because one of its organs is deceased; the working could not be accomplished with perfection, or at least with ease, if there should exist a slight excoriation in the sole of the foot or if there should be a thorn stuck in a joint, and as to the rest of the functions, do we not see the great consequences which are produced in the life of a person on account of slight obstacles in the circulation, or when a moral emotion interrupts the complicated functions of the nervous system? Even in the Universe itself, could any plant exist if the nourishing organism should not decompose the organic matter into ammonia, nitric acid, etc., to convert afterwards into nitrates which are essential to its nourishment? Could animals live if the plants should not produce nourishing elements necessary to their existence? Could the planetary system move with the astonishing regularity which characterizes it, if one of its bodies should break the general harmony? Therefore, if this happens with regard to organisms, groups, or physical systems, would not the same happen with society, the organism of which is so complicated, and its laws so subtle that we cannot even realize them?

It surely must be subjected to this general harmony, and its evolution would be interrupted and even checked if the number of active forces should be interrupted or interfered with, though this fact may manifest itself only in one of its organs, or in an important group of its components. And this is so because, just as the whole requires for its perfect evolution, its integration, just in the same manner each part more or less different, of the individual, requires also its proper integration to duly fulfil its mission and to contribute to the harmony of the general function. Now, there is no need of any great penetration to understand what happens in society, when considered as divided into groups characterized by its

intellectual and pecuniary aptitude to contribute to the general good. Is it not true that those who are placed in the higher walks of life are not only in a position to provide for themselves, their own well being, but also to secure the welfare of others? Is it not true that, in the case of some individuals, poverty is the principal cause of moral degradation and physical degeneration, and that this calamity can be regarded as a double disease, that is to say, the disease of the individual and a disease of society?

Whether we regard pauperism as one of the organs of that collective being which we call society, or whether we consider it at least as an important group, even for the sake of the great number of unities that constitute it, we will readily understand the great damage that may result to society from failing to realize the great number of active functions corresponding to this part of society.

The individual who does not work and who consumes, is not only a paralyzed but prejudicial capital, because of the consumption it requires, thus becoming a painful burden which must be supported by the active part of society. In this way the family itself, society in general, and the whole nation have in that lack of work an actual loss which prevents or renders difficult the development and prosperity intrusted to it in the Universe.

But the pauper does not only injure because of the share which he fails to contribute to the social body to which he belongs, and because of the injury caused by him to said body, but also because he contributes in a direct manner to make worse the hygienic conditions of the houses and persons with whom he comes in contact, all of which is equivalent, by reason of the relation of contiguity more or less intimate which exists between all individuals, to make still worse the hygienic conditions of the community, to undermine public health, to shorten the ordinary term of life, and also to make worse the conditions of the species.

The poor man who is in want of the most essential elements for his education, entirely neglects the care of cleanliness which is next to godliness, and constitutes a focus of corruption and filthiness.

If he has a family they live crowded in narrow quarters where they satisfy, in intimate relation, all those necessities of life, for the fulfilment of which morality and health demand separation. Living in small rooms with one single door which is closed at night, thus preventing proper ventilation; having as a floor the earth, actually infected by filthy water from culinary uses and even the evacuations of the dwellers themselves, they make their home a veritable sewer. All the members of the family and even a great number of dwellers, which become veritable parasites of these poor families, spend whole nights in this single room, which during the daytime has been used as a kitchen and dining room, and they sleep in a kind of horrible promiscuity, closely crowded by reason of the accumulation, the father, the mother, the sons, and the daughters, and some times even friends. When there is sickness in the family, these conditions

do not vary, and the sick and the hale are mixed up in the same crowd. How could we wonder to see all the members and dwellers of these habitations fall sick one by one, victims of an infectious and terrible disease, becoming indefinitely veritable focuses of infection and endangering, God knows to what extent, and to what space of time, the health of a whole city?

It is difficult to conceive how human creatures can live in such environments, where misery and filthiness reign supreme, and where the greatest moral and physical degradations have their origin.

Receptivity being thus excited, by this kind of life, to contract any disease, for instance typhus, which is one of the most contagious, spontaneously assumes a vigorous development. In this crowded and intimate life which these wretched creatures lead, the propagation of infection is a first consequence, and thus we see whole families and afterwards numerous groups of paupers attacked simultaneously with typhus, typhoid fever, scarlet fever, etc., etc., and in this way many families often disappear.

Those individuals who recover, undergo the evolution of the disease with the same rags which covered them the day before they fell sick and with which they went about the streets.

When their strength permits them, and while still convalescent, and without having properly cleaned themselves, and in the very period in which the disease becomes more contagious, they install themselves in the most public and crowded places of the city, in the churches, for instance, where either interest or piety leads them, and where other people who visit such places do not stop to think of the danger of approaching them nor of running away or avoiding them. At other times they go from door to door begging for alms, and distributing, in exchange for these, terrible germs of horrible diseases which become more vigorous by reason of having gone through their organism, and thus spreading death and desolation among families, cities, and even whole countries.

The statistics, taken with great care in the inspection of health of San Luis Potosí, show clearly that more than 80 per cent. of the deaths take place among the poor, and that a very insignificant number corresponds to the wealthier class.

There are to be found in the Paris Medical Academy, the notable observations in relation to the typhus epidemic which developed itself in that capital in 1893; there exist yet the interesting and learned discussions brought about by said epidemic and in which M. M. Colin, Rochard, LeRoy de Mericour, Ollivier, Kelch, Broward, Proust, Netter, and Thoinot participated; the eminently convincing conclusions arrived at proved that paupers and beggars from Amiens, were those who brought to Paris the first cases of typhus which constituted the origin of the epidemic; there, where in a century, not a single case of typhus had occurred, and where no one remembered any such case, and if they did remember it, only as a matter of history. During this epidemic the vagabond pauper was seen contaminating another one like himself in

the unhealthy places where they dwell; afterwards they went to the hospital and there infected those that nursed them, physician, students, professional nurses, wet nurses, and the clergy who administer to these spiritual wants and who fell victims to their Christian or professional duty.

The prison, the poor lodging-houses, the common refuge, night asylum, saw passing, successively, their wandering guests, leaving behind them a trace of disease and death.

These epidemics serve to prove that paupers create the germs of typhus, and that, though they themselves may not be attacked by the disease, still they produce it and carry it, endowed with extreme virulence, until they come in contact with the being whose physical condition renders him susceptible of contracting such disease, and where the said disease immediately develops itself; they are, therefore, the generators of this terrible evil and the best agents of dissemination. How terrible is the part that pauperism plays in society. "Hereafter," as Kelch says, "whenever the word typhus is pronounced in any place, it demands the vigilance of the public administration, not only of the poor or vagabond afflicted with typhus, but also of the wandering persons that have not yet been attacked by the disease, since they alone can develop and propagate it."

But it is in our power to remove from the social organism these sick members who are the cause of so many evils.

Public beneficence when properly organized, is the institution called upon by itself alone to succeed in elevating to the category of active and productive members, these wretched creatures.

From time immemorial associations have been established whose object has been charity; they are almost as old as the world, and even savages practise reciprocal assistance; it is a real instinct of humanity.

Even among zoölogical creatures which are considered below human beings, actions of real mutual protection have been observed. Why should not Christian and civilized societies give the same proofs on a higher scale; in fact, charity is commended in the Bible, "Thou shalt love thy neighbor as thyself," which is the most simple and comprehensive form of charity which morality has given to men.

In accordance with these beautiful maxims, we see in history the beneficence of all countries; not only in the distribution to the poor of the most essential materials for their nourishment, but in building veritable palaces where the unfortunate finds the fraternal hand which rescues him from vice, from misery, and from death itself.

These are the high and beautiful schemes which were established in favor of the helpless French Constitution of 1789, and that even to-day would scarcely pass from mere schemes to established facts, if modern societies with the practical sense which characterizes them, should take hold of such schemes; accepting public beneficence as a principle regarded from the point of view of human solidarity, it would not only be a professional virtue, but a duty that binds conscience.

The committee appointed to this end proposed to pay special attention successively and separately to the child, the man, and the aged; of the child, in order to guarantee him his livelihood, his moral education, and then his work; of the man, to give him bread when he is unable to work and care for him when he is sick; of the aged, that he shall not lack in his last days those cares and attentions which are proper and necessary at this stage of life.

The funds for beneficent purposes should be sufficient to cover the following wants: work for the helpless, charity at home for the sick and aged, sanitariums for the homeless sick, and assistance for cases of unforseen accidents.

There are already foundling hospitals, art and trade schools more or less properly provided for, hospitals, and asylums, but it is an urgent necessity to establish, where there are none, lodging houses, public dining rooms under the name of "Economical Kitchens," and also economical public baths.

In both establishments the working-man will be able, for a small sum, to have health and sufficient food, baths and washing, a comfortable and clean bed where he can rest from the fatigues produced by his rough, daily work.

The pauper should be furnished with the necessary means to procure for himself those comforts, in exchange for work in the public works, in the factories of the government, and even in private works, said work being of course in accordance to his strength and capacity.

As the legislation relating to pauperism is very deficient in some places, and its application being still more neglected, it should be organized more efficiently, imposing the severest punishment to the vagabond pauper and arresting them in every case without any consideration whatever.

Just as the authorities pay great attention, strenuously prohibiting, under pain of punishment more or less severe, the use of forbidden fire-arms, just in the same manner should they forbid the paupers the freedom to wander about at their will, subjecting them to most perfect isolation, since they also carry terrible arms which endanger the lives of those with whom they come in contact, arms which are so much more terrible for the very reason of their being invisible, wounding at will right and left, there being no shield invulnerable to their blows.

Therefore, I have the honor to propose to this society to appoint an international committee to study and submit for its approbation, laws and by-laws for the purpose of divesting pauperism of its injurious influences to public hygiene.

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The American Public Health Association is not responsible for the sentiments expressed in any paper or address published in this Journal.

REPORT OF THE COMMITTEE ON CAR SANITATION.[1]

By GRANVILLE P. CONN, A. M., M. D., Chairman, Concord, New Hampshire.

Your committee in reporting upon this subject desires to remind the association that in consequence of the general stagnation in business circles, traffic of all kinds upon the railroad systems of the United States has been far below the average since our last annual meeting; and the management of railway corporations have felt that it was important to inaugurate a system of retrenchment and reform, quite as much as it has been found necessary to curtail expenses in other branches of business. It is but a simple act of justice to the management of our railroads to state this fact, as in many instances rolling stock has been used another season that under more favorable business conditions would have been retired or remodeled for a different service.

Anyone having occasion to inquire into the relative financial conditions of our railroads or make a sanitary inspection of passenger coaches during the present year must have been impressed with the fact that no one regretted more than the management, that the surplus of earnings over fixed charges was too small to allow most roads any large expenditure in new and improved cars and other rolling stock. In this, railroads have suffered quite as much as individuals and other corporations, and any change for the better will be most gladly welcomed by the management of railroads as well as any other commercial or manufacturing plants.

The report of the committee at our last annual meeting was reprinted from the publication of the association in pamphlet form and many copies were sent to the managers of railways and their several departments. To the committee, it was a most gratifying fact, that it was well received, and many letters were received by the chairman that were encouraging in their character towards the continuance of this great work, of which the following will serve as an example. The proverbial modesty of the General Passenger Agent forbids my disclosing the identity of the writer.

Dear Sir:—I beg you will accept my sincere thanks for copy of "Report of the Committee on Car Sanitation," at the last annual meeting in Denver. As a G. P. A., I desire to convey my appreciation of the very

[1]Presented at the Buffalo meeting of the American Public Health Association, Sept. 15-18, 1896.

courteous language in your report this year, as I did also your able report of last year.

The work in which you are engaged is one that cannot fail to attract the attention of all thinking railroad men, and I thoroughly agree with you that in a short time this matter will receive the attention and consideration to which it is certainly entitled. A thought has occurred to me on this subject which I venture to suggest to you, although it may be an old idea, perhaps abandoned. It is this, the placing of "Car Sanitation" as a department under the supervision of the railway surgeon or chief medical officer of each railway. As there may be good reasons which you have already discovered why the above may not be practical, I will not attempt to elaborate on carrying out the above suggestion into a working plan.

With kind regards, and wishing you the success which your patient efforts so well merit, believe me,

Very truly yours,

The paragraph in that letter suggesting the placing of car sanitation as a department under the supervision of the railway surgeon or chief medical officer of every railway, deserves more than a passing mention. In papers read before the National Association of Railway Surgeons, your chairman has repeatedly taken this position, and advocated the enlargement of the duties of the railway surgeon, to the extent of his being the supervisor of the sanitary condition of the rolling stock, stations, etc. I am happy to add that the surgeon of the great Erie system, one of the last to adopt a department of railway surgery, has incorporated into the rules and regulations governing employees and local surgeons, provisions relative to this subject.

This is a move in the right direction and should receive attention from all roads having a chief surgeon.

Your committee in its investigation of the subject, and anyone who will take any interest in this matter, will soon become convinced that there is something lacking in the manner in which cars are cleansed and kept in good condition for the traveling public. In our last report, after giving the replies of several railroads to whom we had sent a series of questions regarding the system of sanitary inspection of their cars, we made this remark:

"It is easy to understand that the general superintendent of motive power, being a man well versed in mechanics, naturally gives his first attention to the locomotive that is to draw the train, and but few of them ever get beyond that, taking little thought of whether that locomotive is drawing freight or passenger cars."

In commenting upon this, the editor of the *Railway Car Journal* said: "The committee takes a dig at the mechanical department and here displays either ignorance or prejudice, for while there are some motive power officials to whom the description would not inaptly fit, they are few in number and becoming scarcer daily." In this connection, your committee desires to explain that it was not its intention to be discourte-

ous to any person, and certainly the mechanical department of every railroad has altogether too much upon its hands for any person to criticise who has any understanding whatever of what the duties of the officers may be. It was the intention of the committee to be understood as suggesting that these motive power officials had so many duties to perform that all the minor details, like the cleaning of cars, taking care of stations, and looking after the sanitary condition of road beds was more than ought to be expected of them. In this connection, we desire to say to all officials of our railway management, that your committee has no intention whatever of being personal, and hopes to be able to avoid any appearance of being actuated by critical motives. It is our wish to assist in inaugurating a reform rather than to throw any obstacle in the way of substantial progress in the sanitary conditions attending railway traffic.

It is easy to see from the letter that has been quoted that other departments of railroads take much the same view, and on all railroads having a medical and surgical department, I can see no reason why that department might not be made advisory to the motive power department on all questions pertaining to sanitation.

The *Railway Car Journal* stated that objection had been made to the using of compressed air in the cleaning of cars because that dust and grit carried along by the stream of air from the nozzle was of such a nature that it had a damaging effect upon the varnish, and which was compared to the effect of the sand blast. There is no doubt but when improperly or carelessly used such might be the effect, and in this as in all other departments in which progress is the watchword, it will be found necessary to employ for such labor, men with a higher degree of intellectual ability as every new and progressive movement requires a higher grade of understanding to carry out all its details. The time has gone by when anybody and everybody can be sent to the car cleaning department and do effective work. This is well illustrated in a paper to the *Railway Car Journal* by Mr. James A. Gohen, M. P., C., C., C. & St. L. R'y, who has evidently given this subject a great deal of thought, and has come to the conclusion that more brains and less muscle is sometimes needed to do good work. He says: "I have often wondered why railway companies have been so slow, or negligent rather, in regard to passenger car cleaning at terminals, both as to exterior and interior. They do not hesitate to expend from $150 to $400 in painting and decorating a first-class coach, parlor, dining, or sleeping car, but there it ends. Why do they not properly care for that car after it has left the paint shop? On some roads nothing is done to a coach from the time it leaves the paint shop until it goes in again for revarnishing, and the smoke, grease, and dirt have so incorporated themselves with the paint and varnish that it might be said desperate methods are resorted to in order to clean it properly. Soap strong enough to dissolve the paint or varnish, or a weaker soap with the addition of pumice stone, is the requisite. If the latter, the friction in cleaning destroys all edges of battens and grooves so that

unnecessary touching up is required. This method is bad enough, we all know, because of the fact that four fifths of the time the car was in service it was so dirty that it was far from being to the painter who did the work 'a thing of beauty and a joy forever.' To the traveler it was a filthy, badly-ventilated, foul-smelling affair, better fitted as the abode of 'the gintleman that pays the rint,' as they say of the hog in Ireland, than of a sensitive woman or man. To the company that owned it there was little recompense for the money spent in painting. It added no tone to the equipment. It was an eyesore to those who can appreciate a clean, well-ventilated equipment.

"That is the history of the coach that is never cleaned. But what of the one that was cleaned? Ninety per cent. of the car-cleaning in this country is a delusion and a snare, because it is senseless, spasmodic, and inefficient. The usual custom is to entrust this work to some one who does n't know any more about how to treat a well-painted coach than I do about astronomy,—and that is mighty little. It is assumed that anyone can clean cars. All that is necessary is to scrub the dirt off. That 's all. And it is scrubbed off with a vengeance. If soap is used and it is n't strong enough, 'Oh, put in a little lye or sal soda; that will fetch it.' And it usually does—the varnish and paint as well. I have seen nice, well-painted coaches ruined in this way very shortly after coming out of the shop; but no one knew how, when, or where it was done. But it was done and done quickly. There is positively no excuse for this wanton waste and destruction of paint. It borders on criminality. If the railway managers generally knew the economy, the pleasure, and the satisfaction of common-sense, practical car-cleaning, such as only a few do know and practise, there would be a general 'moving day' at the terminals of some roads in this country.

"If it were only known that thorough, systematic, and regular cleaning of passenger cars was cheaper than haphazard, spasmodic cleaning, it would be adopted. I know that such systematic cleaning will reduce the cost of painting materially, because the paint or varnish, not being destroyed, will come very near wearing its natural life. The companies will have the benefit of the service of coaches from three to six months longer, and when they do come in it will not cost so much to repaint them. And last, but not least, the cleaning will, after awhile, cost little, if any, more than that done by main strength and awkwardness."

The fact that mechanics and mechanical engineers allude to the hygienic condition of passenger cars should give us much encouragement, for it is from them we can ultimately expect a reform. In another paper to the *Railway Car Journal*, Mr. Gohen, in referring to the lighting and ventilating of cars, says:

"Speaking of overheated cars reminds me that our coaches are worse ventilated than overheated, and the question is asked again and again, How can we improve the hygienic condition of our passenger cars? Did you ever stop to consider that the thinking, common-sense housewife

realized the *sine qua non* of sanitation, 'God's sunlight and air,' when she daily airs her bedroom and its contents? How many railways make it an object to close all windows and lock all doors from the time a coach arrives in the yard until it departs again, except the very short interval consumed in cleaning, where such a luxury is indulged in, if at all? And how foolish such practice! Why not air them and sun them when lying in yards, or in going to or coming from the station? 'Oh,' you say, 'if the coaches are left open vandalism will prevail.' Better hire a watchman, if you have n't one, and have sweet-smelling cars at a cheap price. Exercise a little common-sense, and, like the good housewife, be the gainer thereby.

"Another thing that would be conducive to cleanliness and healthfulness would be the abrogation of all urinals in saloons, using only dry hoppers with close fitting lids. [We can't help saying 'Amen' to this in true Methodist fashion, as we go along.—ED.] This will obviate the use of camphor balls, carbolic acid, and other disinfectants, which remedy is regarded by many as bad as, if not worse than, the disease. A dry closet with close fitting lid will ventilate itself by draught from the movement of the train. Then if the train operators will carefully regulate the transoms and raised deck-sash, the cars will not be so foul smelling as the generality of them."

In our last report, Mr. Morris, superintendent of the motive power of the C. & O. River, suggests that in order to obtain any improvements in the heating, ventilating, and cleaning of cars, it would be necessary to discipline thoroughly all of the train men and employees connected with this branch of the service, so that they will be aware of every sanitary need for the healthy condition of trains. If such language was used by anyone connected with railway service regarding the movement of trains for the safety of the public, it would be considered reprehensible that men employed in that service were not disciplined in the work which they were expected to perform.

It has been found necessary to have schools of instruction for train men in order that they may keep up with the progress that has been made in the movement of trains. Cars are fitted up with the latest improvement in automatic brakes and go around from division to division with an instructor, that men may be thoroughly schooled in the duties and possibilities in applying those useful inventions for the safety of public travel.

To your committee, it seems as though it was very necessary that men be instructed and well informed in all the duties pertaining to the cleaning of cars and keeping them in proper condition. Much of the furnishing of first-class coaches is expensive and very delicate in its texture, requiring a great deal of care that it is not utterly ruined in a very short period. The same may be said in regard to the finish and painting of coaches. In caring for these conditions, ignorant and untrained help may and do destroy a great deal that should be taken care of, and in that

way, the expenses of this department are far beyond what is actually necessary.

Your committee are well aware that the same conditions exist in foreign countries regarding the hygiene of railway cars, that are prevalent in the United States. The *Railway Gazette* only a short time since, gave the following on Car Ventilation:

"The General Railroad Inspection of Austria issued orders July 29, last, calling the attention of the railroad managements to the inadequate ventilation of the passenger cars during the summer months, and instructing them to enforce energetically the rules which require the employees to open the car doors and windows, and get them thoroughly aired a suitable time before the trains are made up. A recent sufferer humbly begs the Imperial and Royal Inspection to extend its authority in this particular to this country, and to send its sharpest inspectors with their most effective weapons to watch the parlor cars, which are here so often more like ovens than places for the abode of human beings, while receiving passengers at terminal stations."

About March 1st, your committee, through its chairman, sent out to the management of different railways the following circular letter and interrogatories asking their opinion upon this subject:

DEAR SIR:—The American Public Health Association, composed of members from all professions and vocations in life, and representing the United States, the Dominion of Canada, and the Republic of Mexico, in their annual meetings at some point within these three countries, discuss all measures intended to promote public health and comfort.

This Association has a committee on Car Sanitation (of which I have the honor to be the chairman) which most cordially invites your co-operation and assistance, for the committee are well aware that the problem confronting them is a vexatious one, requiring the consideration of practical railroad men quite as much as the theoretical reasoning of the sanitarian. Allow me to add, that the committee and the Association have no desire to obstruct, or in any way interfere with, the practical service or management of railroads; and in asking your attention to the enclosed propositions for discussion, we hope and trust you will express yourself without reserve; and should other questions occur to you which are of interest to the public, we beg of you to bring them up for discussion.

Under a separate cover, I send you a report and papers of the committee last year at Denver; and I trust we may be honored with answers to these questions as well as suggestions, that we may use in our next annual report in September, at Buffalo.

Trusting that I may receive a reply within a short period, I am,

Most respectfully yours,

G. P. CONN, M. D.,

Chairman of the Committee.

COMMITTEE ON CAR SANITATION.

Granville P. Conn, M. D., Concord, N. H., Chairman. E. C. Jordan, C. E., Portland, Me. E. R. Lewis, M. D., Kansas City, Mo. Prof. S. H. Woodbridge, Boston, Mass. Domingo Orvanaños, M. D., City of Mexico.

PROPOSITIONS FOR DISCUSSION.

1. Can passenger coaches of all classes be constructed in such a manner as to secure more satisfactory ventilation, heating, closet accommoda-

tion, and cleanliness than now obtains, without any considerable increase in the cost of construction?

2. Do you have on your road any person educated in hygiene and sanitation, who can be held responsible for the sanitary condition of passenger coaches, or to whom the corps of car cleaners are held accountable for the strict performance of their duty? And in your opinion is it practical or good policy to have such a person?

3. Do you believe a car-cleaning department organized under a person fully educated in such work, the same as the general freight or passenger agents should be in their respective bureaus, would increase the efficiency of the system, and with his experience, be able to coöperate with the superintendent of rolling stock, in giving information that might be incorporated into specifications to be observed in the construction of new coaches, thereby giving improved conditions without additional expense?

4. It may not be practical to reject or set out passenger coaches coming from other roads, that are unclean, untidy, and unwholesome by reason of the filthy condition of closets, floors, etc., yet is it unreasonable to establish a system of sanitary inspection that would place the full responsibility of these conditions where it rightfully belongs, the same as is now done in cases of structural defects in rolling stock?

Most of them were answered, but a good many pleaded that they had not the time to give the question at present the time and consideration which they would like.

Through Dr. Orvanaños, the member of the committee from the Republic of Mexico, I have received the following answers from some of the principal roads in the Republic of Mexico.

Mr. H. R. Nickerson, general manager of the Mexican Central Railroad, replies as follows:

1. The cost in regard to Mexico would be expensive on account of the exchange.

2. The master mechanics are in charge of the sanitary conditions of the passenger coaches, and they fulfil their duties very well. In regard to the prevention of the spreading of contagious disease, the conductors take the greatest care about it, and in doubtful cases they take advice from the physicians of the company, who are to be found at all the principal stations. In the past two years two cases of contagious diseases—one of small-pox and the other of typhus fever—have occurred, and as soon as they were known the coaches were evacuated, disinfected, painted, and newly varnished.

3. I do not think it necessary.

4. Yes, in regard to the first part of the proposition.

The answers given by the International Railroad of Mexico, through Mr. Garsuch, are the results of the particular opinions of the gentleman himself and not as a representative of the railroad corporation.

1. Yes.

2. We have not any person educated in hygiene and sanitation, and in my opinion it is not practical to have such a person.

3. I think not.

4. It is not possible to reject, generally, the passenger coaches of connecting lines, because we have not sufficient rolling stock to change them; but we repair and clean those coaches as soon as possible. I think that it is unnecessary to establish a system of sanitary inspection.

E. N. Brown, general superintendent of the Mexican National Railroad, answers those questions as follows:

1. Yes, I think passenger coaches can be constructed so as to secure more satisfactory ventilation, heating, and closet accommodation, and cleanliness, than now without any very considerable increase in the cost of construction. Naturally there will be some increase.

2. We have no person in charge of passenger coaches who is educated in hygiene. We have a responsible man at each important terminal who is in charge of this work and is required to see that coaches, closets, etc., are thoroughly cleaned, and that the disinfectants are replenished and are in proper condition. On our road it would not be practicable or good policy to have a person educated in hygiene unless such person could be made to perform other work in addition to this.

3. Yes, I believe car-cleaning departments on some roads, organized under a person fully educated in hygiene work, would increase the efficiency of the system. Would say that this would depend naturally upon the importance of the road and the number of cars to be cared for.

Mr. Hays, general manager of the Grand Trunk Railway of Canada, makes the following comprehensive reply to the interrogatories which the committee sent out:

To the Committee on Car Sanitation of the American Public Health Association:

I have your favor of March 25th, with pamphlet upon the subject of car sanitation, and, replying to the inquiries you make in the order they are named, will state:

1. The present system of ventilation obtained by means of sashes in the roof of the car, and by the opening of the doors and windows, fairly meets the requirements, having regard to the expense. I am afraid that the term "ventilation" is too often held to cover the question of car temperature. There is no serious difficulty in properly ventilating a car and keeping it at an even temperature, if ice is used in the summer and warm air in the winter, but arrangements would have to be made to prevent the passengers from interfering with the inlets and outlets. Anyone who travels must notice what different views are held by the passengers as to what constitutes good ventilation, and the problem to be solved is how to secure this in an inexpensive manner and without the admixture of dust. The problem can be solved, no doubt, with a not inconsiderable addition to the first cost of the car and with the cost of the necessary ice, and with intelligent manipulation.

2. The employment of a person educated in hygiene and sanitation to see that cars are properly cleaned, may be considered a forward step. Such duties are now performed by the foreman of the car department.

3. I doubt if a car-cleaning department, organized as you suggest, would increase the efficiency of this system, while it would undoubtedly add quite largely to the expense.

4. Conductors and car examiners report cars which are wanting in cleanliness, and upon their reports necessary action is taken to correct the trouble complained of.

I may say that the desire on the part of all railway companies to in every way cater to the public welfare and thereby attract travel to their respective lines, will, even in the absence of specific laws on these matters, insure all the care and attention possible, so far as the sanitary condition of the equipment is concerned.

Yours truly,
CHARLES M. HAYS.

It should be a matter of congratulation to the public, to know that the railway managers of such through lines as the Grand Trunk Railway of Canada recognise the fact that to cater to the public welfare is to attract travel to their respective routes. Mr. Hays says that "the absence of specific laws on these matters" does not matter, as everything will be done to insure care and all possible attention. This is a public spirit that should be emulated all over the country, for everything that pertains to the public health is for the public good, and it was long since demonstrated that "public health is public wealth."

Another railway manager without answering the interrogatories in detail gave the following comprehensive information on this subject:

"The whole question is a difficult one for us to manage in a satisfactory way. Through cars come to us at many junction points, and it is not possible to keep at those junctions a corps of cleaners sufficient in number to go through and clean the cars without unnecessarily delaying the whole train.

"I think our first-class equipment throughout the entire length of its run over this and connecting roads, is kept in fairly good sanitary condition; but the cars occupied by second-class passengers, especially those coming to us from the provinces of Quebec, New Brunswick, and Nova Scotia, while quite wholesome when the train starts, are not in as good condition as we could wish when they reach our line.

"I know of no way to bring about better results in this particular until the people who use the cars have a greater personal desire for cleanliness and sanitation. It is pretty difficult to keep a pig-pen sweet and wholesome so long as pigs are kept in it, and of all animals the 'human pig' is, I think, the least cleanly."

Commenting upon the above, your committee can only say there is no doubt but this is all true, and that the management of all our roads are fully alive to this fact, yet they are not ready to suggest any reform. To the ordinary passenger, when riding over their lines, it has often suggested itself that the average brakeman did not get a very large amount of exercise since the introduction of the automatic brake, and that he might be made useful in keeping his coach in an ordinarily neat and cleanly condition. At least, he might be made an example for others to follow in depositing the shells of his peanuts outside of his car instead of on the floor. The truth is, the public and the trainmen must be educated still further in the fact that the car is a home for the time being of its occupants, and that the tenants of that coach are, to a certain extent, responsible for its healthful, or its unwholesome, condition.

The pig that is a biped may in no wise be less repulsive than his quadruped friend, when he makes a nuisance of himself in throwing refuse upon the floor, or in any way rendering the car unwholesome and unhealthy.

The experience of the vice-president and general manager of the Chicago, Rock Island & Pacific Railway seems different from the others in the fact that the cars from through lines do not come upon his route in an objectionable sanitary condition, as the following will indicate:

DEAR SIR: Answering the inquiries contained in your letter of the 25th instant, would say in reply to No. 1 that I do not think passenger coaches can be constructed with improved ventilation and heating apparatus, etc., without considerable additional expense.

2. We have no such person or officer connected with our road, and it is not, in my opinion, practical or good policy to employ one.

3. I do not think such an addition to our car-cleaning department would be of any particular advantage to this company or its patrons.

4. In my opinion it is not very practical or reasonable to reject passenger coaches coming from other roads on account of any such condition as you indicate. Our experience is that we do not have them come to us in any such objectionable shape.

Truly yours,

W. H. TRUESDALE,
Vice-President and General Manager.

It is probable that cars coming from connecting roads to run over the Chicago, Rock Island & Pacific Railway are thoroughly inspected at terminal and division points for any possible mechanical defect, and should any defect be found, it is charged up against the connecting line instead of being assumed by the road itself. In a sanitary point of view, no objection can be urged, unless it is the expense, against an inspection which will show whether or not coaches are in a clean, healthy condition; and, if found to be objectionable, the blame should be located where it belongs.

Granting that there would be some expense, it would be largely made up in the education of the employees in the cleaning or sanitary department. It would be necessary that they should be educated and trained to recognize and at once comprehend the existing conditions as cars came into the division or terminal station. To all roads like the Chicago, Rock Island & Pacific Railway, that have a thoroughly equipped surgical department, the expense of educating employees for the purpose of a sanitary investigation would be comparatively small, and when the fact was known to the country that such investigations were taking place, it would be largely compensated in the increased reputation which the road would have for catering to the public welfare.

That the public take notice of whether trainmen are educated to the work they are expected to perform, or whether coaches are kept clean and wholesome, it is only necessary to occasionally make an extract from letters of travellers to personal friends or to the newspapers. The following quotation to a newspaper from David Christy Murry, a man

versed in literature and an extensive traveller, will be sufficient to show that roads may get advertising both for and against their reputation for serving the public. Mr. Murry says:

"I have never in my life, in any part of the world, made a more comfortless or unsatisfactory journey. One encounters the national insolence on the French railways; the German officials are notoriously brutal; in Spain, Italy, Turkey, and other countries which, from our point of view, are only as yet partially civilized, the traveller, however cosmopolitan and complacent, occasionally feels his temper stirred by official stupidity and meddlesomeness. But taking them altogether, after a three months' experience, I will bank the American railway officials against the world for a careless indifference to the comfort of the people over whom they rule, and for an habitual, calm, overmastering insolence of demeanor.

"There is nothing in the world like the darky autocrat aboard the railway train. He takes you in charge absolutely, and domineers over you with placidity and trained, conscious mastership, which is almost as comic as it is offensive. I remember the train *de luxe* between Paris and Monte Carlo, over which I have travelled, I dare say, a score of times. I recall the excellent dining accommodation; the no less excellent accommodation for sleepers; the decency, the elegance, of all the appointments; the perfect table service; the civility and willingness of all officials, high and low, and I wonder that anybody, who has had the opportunity of contrasting that splendid service with the slovenly American methods, can approve the latter."

Now, while your committee are quite willing to grant that this seems like an extravagant opinion from an Englishman who delights in having a grievance, yet it fairly illustrates the advertising our roads sometimes obtain. Turning to correspondence of a more agreeable nature, it is a pleasure to report the following from one of our best-equipped Eastern roads:

MAINE CENTRAL RAILROAD COMPANY.

OFFICE OF THE VICE-PRESIDENT AND GENERAL MANAGER.
PORTLAND, ME., April 7, 1896.

PAYSON TUCKER, V. P. & G. M.
DR. GRANVILLE P. CONN, Concord, N. H.:

DEAR SIR: I have your letter of the 25th of March, enclosing questions to be discussed at the next annual meeting of the American Public Health Association.

In reply to these questions I beg leave to say, first. I believe that passenger coaches of all classes can be constructed in such a manner as to secure more satisfactory ventilation than is now obtained, without any increase in the cost of construction. Cars in service on the Maine Central are, I believe, satisfactorily heated and have proper and sufficient closet accommodations.

2. There is no person on the Maine Central educated in hygiene and sanitation who is held responsible for the sanitary condition of the passenger coaches, or to whom the corps of car cleaners are held responsible for the strict performance of their duty. It

might be good policy to have such a person, but that would be an experiment which must be tried before a definite answer can be given.

3. Undoubtedly a car cleaning department, organized under a person fully educated in such work, would increase the efficiency of the present system.

4. It might not be unreasonable to establish a system of sanitary inspection that would place full responsibility of improper conditions where it rightfully belongs, but the establishment of such a system is an improvement which I am afraid will not come in the near future.

I enclose herewith three separate orders which are samples of what we are continually issuing to our employees. They may show you, in some way, about what we are doing in order to have our cars and stations kept in a proper condition. We make every possible effort to secure absolute cleanliness, and I believe that I may say that our efforts have met with a fair measure of success.

Yours truly,

PAYSON TUCKER,
Vice-President and General Manager.

MAINE CENTRAL RAILROAD.

GENERAL MANAGER'S OFFICE.
PORTLAND, ME., March 8, 1893.

(Copy)

ORDER No. 823.

The water closets in passenger cars running over our line, are not properly cleaned at terminal points.

It is imperative that the water closets in passenger cars should be thoroughly cleaned at least daily, and be kept absolutely clean. The hopper and urinal must be carefully washed and freely rinsed with disinfectant, and disinfecting soap must be placed in every urinal.

The windows and the floors in the water closets must be carefully washed, and all the woodwork dusted and wiped.

Particular attention must be given to the water closets in second-class cars and in cars used for emigrant travel to and from Canada and the Provinces.

Trainmen and car cleaners at stations must give this order their careful attention, and obey it fully and to the letter.

Agents at terminal points will be held strictly accountable for the absolute cleanliness of passenger cars which are cleaned at their stations.

Disinfectant and disinfecting soap may be ordered of the general storekeeper, Portland.

The above order applies not only to our own cars, but also to all cars running over our line which come from connecting roads.

Conductors will be held personally responsible for the condition of passenger cars, and water closets in the same, which are on their train; they must personally inspect the same and must report promptly to the assistant superintendent, at Portland, whenever they have a car which is not thoroughly clean.

PAYSON TUCKER,
General Manager.

MAINE CENTRAL RAILROAD.

GENERAL MANAGER'S OFFICE,
PORTLAND, ME., Aug. 4, 1894.

(Copy)

ORDER No. 78.

Trainmen and Station Agents.—Extra Care in cleaning Cars.

All cars used in the passenger service must be thoroughly washed and cleansed, both outside and inside, *at least once each day*, and when cars make more than one trip per day they must be swept and carefully dusted at the end of each trip; particular attention must be paid to keeping the glass clean.

Employees in charge of car cleaning must give careful attention to closets and

urinals in all passenger, smoking, and second-class cars. They will keep on hand an ample supply of disinfectant, and will see that it is freely used, at least daily.

Station agents at terminal stations will be held responsible for the condition of all cars leaving their stations. Conductors will personally inspect all cars of their trains, and if the closet or any portion of a car is found to be improperly cleaned they will report the same by telegraph to E. A. Hall, Asst. Supt.

It is not only important from a sanitary point of view, but it is a matter of pride to have our cars looking well and in strictly first class condition in all respects; it is therefore hoped and expected that no pains will be spared to keep all our cars in the best possible condition.

PAYSON TUCKER,
General Manager.

MAINE CENTRAL RAILROAD.

VICE-PRESIDENT AND GENERAL MANAGER'S OFFICE.

(Copy) PORTLAND, ME., March 2, 1896.

ORDER NO. 262.

To Employees: The management of this company takes pride in the appearance of the station buildings and grounds on the line of the Maine Central Railroad, which our agents and employees keep in an orderly and attractive condition.

Constant attention, however, is necessary to secure these desirable results, and as large amounts of ashes and rubbish unavoidably have collected in and about our buildings and grounds during the winter months, all agents and employees in charge of our property, will, as soon as the weather may permit, see that these buildings and grounds are thoroughly cleaned and put in respectable and sanitary condition.

Water Closets and Privies.—Water closets, urinals, and wash bowls must be thoroughly cleaned, washed with soap and hot water, and privy vaults cleaned out. An ample supply of disinfectant must be freely used in all these.

Windows.—All windows in all buildings, both inside and outside, must be carefully washed, and all broken glass replaced.

Lamps and Lanterns.—All station lamps, outside lanterns, gas and electric light fixtures, must be carefully cleaned and put in proper condition.

Stoves and Furnaces.—As soon as the weather becomes seasonable, all stoves, furnaces, and steam heating plants must be thoroughly cleaned and put in proper condition for the next season. All ashes must be removed and any repairs which may be necessary should be made without delay, in order that all heating apparatus may be in readiness for instant use. All stoves must be blacked and polished.

Floors.—All floors must be swept and thoroughly scrubbed.

Ticket Offices.—Every ticket seller must see that his office presents an orderly and neat appearance. Blanks should be carefully arranged in order, and all waste paper and useless material removed.

Any defects in water closets, urinals, or any other plumbing, and all repairs of broken glass and other necessary repairs, should be made to William A. Allen, Chief Engineer.

Requisitions for disinfectant, cleaning utensils, and repairs to stoves, should be made upon Arthur S. Bosworth, Supply Agent.

Application for the permission to employ extra labor to do this cleaning thoroughly and promptly, must, in all cases, be made in writing to the general manager.

The careful attention of every employee of this company to this order is asked and expected. Nothing adds more to the good reputation of this company than the excellent appearance of its property, and the scrupulous care of all our employees is expected in order to secure absolute cleanliness on every portion of the Maine Central Railroad.

PAYSON TUCKER,
Vice-President and General Manager.

The orders herewith recorded are good models, and worthy of the attention of anyone having occasion to issue rules and regulations relating to the sanitary condition of a railroad or its rolling stock.

The Maine Central Railroad Company controls several hundred miles, that furnishes transportation for all forms of traffic. During the summer season it furnishes a means of communication between the mountains and seashore over which thousands upon thousands of people travel in the pursuit of health and recreation, and as sanitarians, we are well aware that any road having such regulations fully enforced, will be popular with its patrons, who will never fail to call attention to its attractive and comfortable coaches, stations, and well kept roadway.

In conclusion, your committee have to add that the *Railway Surgeon*, a journal published in the interest of the National Association of Railway Surgeons, at Chicago, early in 1896, sent out a circular of inquiry to many of the principal railway surgeons of the country of which the following is a copy, and we append a summary of the answers received as it was recorded by the editor:

1. Is it possible to construct comfortable day coaches and sleepers which can be frequently subjected to efficient disinfection?

2. What modification of the cars at present in use would you suggest?

3. How would you disinfect them, and how often?

4. How would you ventilate them? What would you regard as the most efficient manner of caring for sputum on railway trains?

5. Do you consider the present closet arrangements in cars satisfactory? If not, what changes do the conditions require?

6. What restrictions and regulations should we have in regard to the transportation of patients ill with infectious diseases? Have you any suggestions as to the provisions which should be made for their care en route?

7. Do you consider it dangerous to the healthy to travel and sleep in the same car with tuberculous patients? What particular provision would you make for the transportation of the tuberculous patient? Do you think it pre-eminently necessary to separate the consumptive people from the healthy? If not, what means would you suggest to prevent infection?

8. How far would you permit a tuberculous patient to travel without rest?

Continuing the editor says:

"Summarizing these answers, we arrive at the following conclusions: There is no question of the possibility of constructing an entirely sanitary car; and it might be that such a car could be made as attractive as those now in use. At the same time the attitude of the public toward such a change in construction is uncertain, and no one can tell, until it has been tried, whether the public would welcome or resent the novelty. In the absence of such a general change in car construction, much good can be accomplished (especially on lines running to health resorts) by the use of (a) hospital cars in special cases, and (b) cars with compartments for the use of invalids.

"Meanwhile, with the existing cars, certain precautionary measures are eminently desirable, which may be stated as follows:

"1. All cars should be thoroughly cleaned and disinfected after every run (or at the end of each twenty-four hours on short runs), the use of chemical disinfectants and super-heated steam being the means chiefly recommended.

"2. Some efficient system of ventilation of all cars is generally and urgently needed.

"3. Closets should be improved so that the faecal matter would be retained in some attachment to the closet, under proper conditions, to be deposited at specified places instead of being scattered promiscuously along the line as now.

"4. Sputum should be received in cuspidors in a bichloride solution of mercury and not be allowed to be ejected over the floors and carpets.

"The placing of rigid restrictions round the transportation of tuberculous patients is regarded as difficult, but much good might be done by the use of hospital and compartment cars as indicated; and such patients, should not, as a general rule, be allowed to travel for long distances at a stretch."

"This is a subject of the very greatest importance, and, as we have said, it is a subject which is peculiarly within the province of the railway surgeon. We earnestly urge members of the National Association of Railway Surgeons to give it their earnest attention and all are cordially invited to make use of the columns of the official journal for the expression of their ideas or the advancement of any suggestions that they may have to make."

I also invite your attention to a paper on this subject by Dr. Orvanaños, a member of the committee. He has given this topic much consideration and is well qualified to give information.

It seems unnecessary to make any attempt to summarize this paper, except to say, that the management of our railways are still divided in opinion upon questions affecting railway hygiene. However, considerable progress has been made and we can confidently expect more efficient results in the near future; for whenever able men like our railway managers begin an investigation into matters relating to cause and effect, or the possibilities of a profit and loss, nothing deters them from bringing to bear upon such questions the combined wisdom of the world, including the mechanic and the sanitarian.

Professor Woodbridge, of Boston, has had drawings made to represent improvements in the heating and ventilation of coaches, but he did not have time to make a detailed description of the work; and I would respectfully suggest that he be continued a committee to finish and present his plans to the next annual meeting.

The chairman would still further suggest, that as the general work of this committee has been going on for several years it might be well to allow its place upon the programme of the Association to be given to some other form of sanitary work, and this committee be discharged.

OBSERVATIONS ON THE CLEANING OF RAILROAD PASSENGER CARS.[1]

By DR. DOMINGO ORVANAÑOS,

Member of the Superior Board of Health of the Republic of Mexico.

In order to discuss this question, I have interviewed at length several physicians who have travelled extensively, as well as railroad employés, and I have borne in mind what has been presented at the meetings of the American Public Health Association, and have also given the subject considerable personal attention.

Eight or ten years ago, when surgeons began to discuss the best methods to obtain asepsia of their instruments, there were many opinions as to the media that ought to be used and the methods that ought to be employed. Nevertheless, it was easy to see, that whatever disinfectants were employed and whatever the modus facendi, the results did not always turn out as expected, and that in spite of all precautions, wounds were sometimes infected. It became necessary to make radical changes in the construction of the instruments and even of the cases in which they were kept, and it was then found, that instruments could be made aseptic with the simplest means, in a very short time and with the greatest facility. As they are at present constructed, passenger cars on the railroads can not be cleaned or disinfected, with either ease or perfect security; in fact the carpets, the woolen cushions, the hangings, curtains, and other ornaments will hardly allow of a complete cleansing, either during transit or even at the terminal stations of the lines. Among railroads which have a large traffic we find many stations in which a great number of passengers get in and out of the cars; many of them are clearly diseased, and these leave in the cars the germs that later on can propagate the disease from which they suffer. Of what use is it to clean out the cars every three or four days, with whatever care it may be done, when with the present construction of the cars it certainly cannot be perfectly done, and if during the time between one cleansing and another, these cars have become infected with the germs of disease? To afford any security against contagion, it is necessary that these cleansing operations should be carried out several times a day, and even then it ought to be of an easy, quick, and above all, efficacious character. To attain these objects, the passenger cars ought to be constructed in a very different manner from their present style. It would be necessary, in the first place, that the floors, walls, and roofs should be impermeable; secondly, that all the entering angles should be rounded off, and all,

[1] Presented at the Buffalo meeting of the American Public Health Association, September 15–18, 1896.

projecting carvings and other structures should be suppressed; thirdly that all kinds of hangings and carpets should be taken off; fourthly, that the seats and their backs should be easily taken off so as to be replaced by others; fifthly, that the closets should be provided with hydraulic obturators and an abundance of water, containing sulphate of copper in a solution of fifty per thousand.

It would also be desirable that the whole of the bed clothing, including the blankets and curtains, should be changed daily, as well as the mattresses, at least at the terminals.

It might be thought at first sight, that if the passengers would carry with them the most indispensable articles for their beds, such as a sheet and a pillow or other similar cover, they would be less exposed to the contagion of any disease; but we ought to reflect, that it is not every individual who is cleanly in his habits, and that when treating sick people, those objects might be infected to a still greater degree than would be the case with the articles that they might make use of during their stay in the cars; that is to say, that the danger of each passenger contracting a disease through the clothes with which he comes into contact, would diminish; but on the other hand, the danger in my opinion would increase in an appreciable proportion, with respect to the germs that might reach him from the clothes of other persons. In the National prison in the city of Mexico, epidemics of contagious diseases have always commenced in the department dedicated to short sentences, that is to say, to those individuals who are only to be there a few days, and who generally bring from their own houses the clothes and utensils which are most indispensable for a short detention. I believe that with respect to the bed clothes of individuals who are crowded into such a small space as a coach, we ought to be perfectly certain that they are all clean, and that their use can not result in danger of any kind to the community in general.

When the cars are constructed in the manner above indicated, their cleansing can be carried out as follows: In the first place, several times a day and in the places that may be considered most convenient, all the parts of the coach, where accumulations of dust, sputa, etc., have been noted, should be wiped with a sponge or cloth which should be well soaked in a solution of bi-chloride of mercury at 1 per 1,000; in the second place, the seats and backs of the sofas should be changed every twelve hours; and in the third place, the whole inside of the car should be thoroughly washed at every terminal station, and then be carefully dried.

I think that I may be under the obligation of indicating in this paper the best methods for cleansing the coaches that are at present used on railroads; but it appears to me, that under the circumstances, there are no simple and quick means of carrying out this operation in such a way as to guarantee the results. Since this question of railroad hygiene has been brought before this Association, I think I have noticed that the

public takes an increasing interest and gives more attention to the subject; the railroad companies themselves, at least as regards those in my own country, appear disposed to undertake some reforms. It is a part of our duty to continue indicating all the dangers and difficulties which we observe in railroad cars, and when the majority of the public sees with horror, as it certainly will shortly do, those foci of infection that are dangerous in proportion to the elegance of the interiors, the builders will decide at last to undertake the first experiments that are necessary to accord with sanitary science, and there can be no doubt, that the results will correspond to their efforts and sacrifices.

THE CONTAGION OF VENEREAL DISEASES ON RAILROADS.[1]

By Dr. TOMAS NORIEGA,

Secretary of the National School of Medicine of Mexico.—Delegate from the State of Chiapas to the American Public Health Association Meeting in Buffalo.

A year since at the meeting of the American Association of Public Health, held in the city of Denver, I presented a short paper upon the night ventilation of sleeping cars, where I proposed a plan for ventilating sleeping berths. I there observed the great interest with which the association received anything which initiated improved railroad hygiene and afterwards, at seeing all those papers reproduced in various medical periodicals in the Republic of the United States, the conviction which I have of the importance of this branch of hygiene is more and more strengthened. For this reason and being honored by the delegation of Chiapas to represent it in this congress, I will now treat (but only briefly), of another phase of railroad hygiene.

Some time since a distinguished oculist of the city of Mexico informed me that he treated a young railroad employé on one of the Mexican railroads, for blennorrhagia ophthalmia of both eyes and this terrible ailment was contracted in a railroad car.

The case was as follows:

Mr. X, a married man, aged thirty years, in good health, free from blennorrhagia or any other ailment, arose from his berth one morning, and, as was his custom, washed his face and hands in the lavatory of the Pullman cars; two days after, he felt the first symptoms of purulent ophthalmia, on account of which he came to consult the physician who related to me the history.

The patient was treated with all the care and energy which the case required, and, in spite of the efforts of my skilful and intelligent colleague, the right eye was lost.

A careful examination of all the circumstances of this case showed conclusively that neither the patient nor his wife had a gonococcus disease; and that the disease could have had no other entrance to the system than through the lavatory of the car. As in this case, there will be others whose origin remains unknown, either because the patient is ignorant of the possibilities of being infected during a journey, or because the physician, being sure of his diagnosis, is more interested in effective treatment than he would be in making an investigation into the etiology of the disease.

[1] Presented at the Buffalo meeting of the Association, Sept. 14–18, 1896.

A young man, Z, born in one of the ports of Mexico, had a brother suffering from blennorrhagia; one day the latter bathed the affected parts, and the brother habitually used the same wash-basin; in consequence of this, he contracted purulent ophthalmia in both eyes and became blind. He came to the City of Mexico and consulted several physicians, but the case was incurable.

This observation shows the probability of a venereal disease in a railroad car; but the first case proves the reality of the fact. But it is necessary to consider that not only the lavatories can contain the germs of contagion, but also the bed-clothes, and above all the water-closets.

Blennorrhagia, simple and Hunterian chancre, suppurating and open bubo, syphilitic cutaneous diseases, some mucus, particles of ulcers of the mouth, pharynx, or anus can easily contaminate the bed-clothes, the water-closets, and the lavatory. It is, so much more, the bounden duty of the physician to urge upon the directors and inspectors of railroads, those measures which are the most effective to prevent the dangers of infection.

Confining myself for the present only to venereal diseases and having shown that there are three places where the traveller runs the danger of contagion, that is to say, the bed, the lavatory, and the water-closets, I believe that sanitary principles ought to be applied to these three.

1. *The Bed.* Not being possible to effect a daily change of mattresses, pillows, and blankets to be washed and disinfected, it would, at least, be desirable that they should periodically be submitted to these operations; at any rate, by no means ought the happy custom which obtains in all the sleeping cars, of daily changing the sheets and pillow-slips, be allowed to relax.

2. *Lavatory.* In order to keep inoffensive the wash-basin of the passengers, it is necessary, in my opinion, that a servant should always be in the lavatory of the men, and be within call for that of the women, that each time the basin is used it may be cleaned with antiseptic soap, as of cyanide of mercury of 5 to 1,000 and afterwards rinsed with a solution of the same. The same should be done with the glasses, brushes, and combs, but it would be desirable that passengers should provide their own.

3. *The Water-closets.* Each time a passenger uses the closet, he ought to call the servant that he may clean and disinfect the seat and waste pipe, with the same care and materials as for the lavatory.

I think it would be a great advantage to arrange impermeable paper covers of the same shape and dimensions as the seat of the closet; these covers ought to have an opening of the same form and dimensions as the receptacle, which should have a cylinder long enough to reach the upper part of the waste pipe.

Each closet should be provided daily with a sufficient number of these covers placed within reach of the passengers and which should be de-

stroyed after they have been used. I confess, frankly, that the recommendations which I have rapidly submitted to you are capable of improvement, but all those, as I have formulated them, will be a protection without doubt against the terrible contagion of venereal diseases.

DISCUSSION ON CAR SANITATION.

Dr. Ferd. C. Valentine, of New York city.—In the beginning of my career as a genito-urinary specialist, I saw the most marked case I ever met, which accentuates the warnings so well given in the learned paper we have just heard.

The patient, a mere girl in years, was on her wedding trip. On arrival in New York, she consulted an excellent general practitioner for an ulcer on her lip. The doctor referred her to me for diagnosis. The husband had no evidence of any disease. The ulcer on his wife's lip was a true, hard chancre.

The patient, with girlish curiosity, opened a bottle containing iodoform and immediately recognized the odor as that which emanated from a man who had sat in the seat before her on the car. This person, in all probability, had used the closet or urinal, or may have renewed the dressings on his genitals and without washing his fingers have carried syphilitic pus to the drinking-glass at the ice-water receptacle. Our young patient, in all likelihood, drank from the glass, and by means of a slight abrasion of the lip, contaminated herself, possibly for life.

However, I do not present an individual opinion in dreading syphilis less than gonorrhoea. In a paper, which I shall have the honor of presenting to this body on Friday, I have incorporated facts which bear out this dread. German statistics, the only ones available to me just now, show that of children born with healthy eyes who subsequently became blind, *80 per cent.* lost their sight from gonorrhoea. Of the women who died in 1894 from diseases of the womb and its appendages, *80 per cent.* were traceable to gonorrhoea. Both blindness and death in most instances were due to gonorrhoea, which the husbands and fathers had had many years before, and of which there had been no manifestations for a long time prior to marriage. The author of the paper under discussion gives ample proof, in the cases cited, that something must be done to protect the traveling public. But is it feasible? Some efforts are made in this direction. When the Red Star Line was running under that name between New York and Antwerp, an employé of the company provided each passenger with a clean wooden-seat to be used on the water-closets. Each seat, after use, was disinfected anew. In Germany, water-closet covers of impermeable paper, such as the author suggests, are sold at some railway stations. On the Continent, the traveler sees no public combs or brushes; and soap, which offers such facility for contagion, is not provided. It would, indeed, be better if travelers arrived at their

destination with unclean faces, than with eyes infected by gonococci left in wash-bowls.

Dr. Albert L. Gihon, U. S. Navy.—I only desire to say a word or two to supplement what Dr. Noriega has stated. Some years ago I gave a great deal of attention to this subject, and I simply wish to repeat now a certain possibility which came under my observation on a Pullman car, on my way to the Savannah meeting of this Association. In the seat directly before me was a man whose occupation was evidently that of a drummer. He wore a cap, and in the process of rolling his head about the cap fell off, and I saw a well-marked case of syphilitic eczema of the scalp. I saw that man grind these vesicles into the linen cover of that seat. I saw him leave the car. I did not see, however, what might have happened if a little child had succeeded him in occupying that seat, and had turned around upon its knees as children do, perhaps bringing its lips in contact with the syphilitic smear. I can fancy a child doing such a thing, and I have always felt that that was a possibility in this particular case. I do not know what damage was actually done, but very serious damage might have been done, and I am glad Dr. Noriega has again brought up this subject, and I hope the members of the Association will freely discuss it to-day.

Dr. J. J. Kinyoun, of Washington, D. C.—I had the honor of addressing the Association at its meeting held in Denver last year, for about six or seven minutes on the disinfection of railroad coaches. I regret that I did not have an opportunity to revise my remarks, because some of the statements printed in the *Journal* make me responsible for things which I did not say.

The report and papers which have been read deal with important subjects, and I can only briefly touch upon them in the short time at my disposal. These remarks are intended only as preliminary to a report which is forthcoming from the Marine Hospital Service on the subject of purification and disinfection of railway coaches. At the last meeting of the Association, I called attention to the application of an agent known as far back as 1869, which can be advantageously used for this purpose. I refer to formaldehyd, and as I know a little more about the subject than I did then, I propose in subsequent papers to consider the subject of formaldehyd as a disinfectant.

In order to determine whether railway coaches could be cleansed and disinfected without material injury to the different parts of the car, the following letter was addressed by the Surgeon-General to all railroads centering in Washington, a part of which letters, with your permission, I will read.

At present there is being conducted in the Hygienic Laboratory of this Service an inquiry into methods pertaining to car sanitation, and those especially pertaining to the purification and disinfection of railway coaches.

It is the intention that this inquiry not only include those applicable to the cars which are infected with or have been exposed to infection from the recognized quarantinable diseases, viz.: cholera, typhus fever, small pox, yellow fever, and plague, but to other diseases as well.

The methods which are now recognized as efficient for disinfection are open to objection, on account of the damaging effects upon the upholstery and decorations. It is believed that in the very near future a system can be formulated by which the major objectionable features can be done away with, and that purification and disinfection can be accomplished in a practicable and feasible manner, with but little expense and loss of time.

In order to ascertain whether the methods now under investigation will in any way be injurious to the different fabrics used in the upholstering and equipment of railway coaches, it will be necessary to test the various materials used in the upholstery, bedding, and carpeting.

I have to invite your coöperation in this matter, and would request that, if possible, you will forward to this office, samples of the aforesaid materials for these tests.

Respectfully yours,

(Signed) WALTER WYMAN,

Supervising Surgeon-General, M. H. S.

OFFICE OF THE SUPERVISING SURGEON-GENERAL,
MARINE HOSPITAL SERVICE,
WASHINGTON, D. C., Sept. 8, 1896.

GENTLEMEN: On July 18th, 1896, a letter from this office was addressed to your company, calling attention to certain experiments now being conducted in the Hygienic Laboratory upon the disinfection of railway coaches and their contents. You were asked to coöperate by submitting samples of material used in the upholstery and furnishings of the passenger coaches, and your prompt compliance with this request is again with thanks acknowledged.

The experiments above referred to have progressed satisfactorily, and have now reached a stage where they should be of more practical character—that is to say, tests should be made within a railway coach.

Your further coöperation is solicited, and it is requested, if possible, that you will place at the disposal of the officer in charge of the Hygienic Laboratory, facilities for carrying out this work. The contemplated experiments will in no way injure the car or its furnishings.

If such privilege be granted, it is desirable that your company be represented at these tests.

I would add that, if an inexpensive, scientific method of disinfecting railway coaches without any possible injury to the wood or fabrics therein is found, it is contemplated, with your coöperation, to institute an inquiry as to the necessity of car disinfection. This matter is one that is attracting the attention of public health officers throughout the United States at the present time. As may be seen in the various published reports of public health organizations, there is a growing belief that the railway coach plays no unimportant part in the transmission of disease, particularly diphtheria and tuberculosis. At the present time, however, the data collected are not sufficient to determine to what extent this belief is justified, it being grounded chiefly upon inferences drawn from the known behavior of infectious diseases in habitations, and it would not be proper to draw positive conclusions, because the conditions in a railway coach are different. For determination of the matter it will be necessary to make a number of observations upon the sanitary condition of a number of cars at different times and places.

I have, therefore, respectfully to request an expression of consent upon your part, and that facilities be extended for making these observations; I would be glad if the medical

corps attached to your railway service would aid in said observations. After completion of the observations it is proposed to submit the results to your company with a view to arriving at conclusions of practical benefit.

Respectfully yours,

(Signed) WALTER WYMAN,

Supervising Surgeon-General, M. H. S.

These experiments, so far as purification and disinfection of railway coaches are concerned, are now being continued and will be continued throughout the next year, because the subject is one almost interminable in character. It is proposed first to take up diphtheria and tuberculosis. For the purpose of determining whether the disease tuberculosis is communicable through railway coaches, it is proposed to take a railway coach at the terminus of tubercular health resorts, collect the air and dust, and see whether the germs of the disease are present and are capable of producing disease.

With reference to railway coaches as carriers of disease, it is also proposed to extend the inquiry to the water supply of the railway service. It is believed at present that many cases of diarrhoeal disease, if not fevers, are contracted through the impure water furnished on the railway coaches.

REPORT OF COMMITTEE ON STEAMSHIP AND STEAMBOAT SANITATION.[1]

By F. MONTIZAMBERT, M. D. EDIN., F. R. C. S., D. C. L.,
General Superintendent of Canadian Quarantines, Chairman.

Your committee on steamship and steamboat sanitation, in now reporting progress, begs leave to submit that the reports made by this committee under the chairmanship of Dr. S. H. Durgin in 1891, and of Medical Director of the U. S. navy, Dr. Albert L. Gihon, in 1893, leave little to add to the subjects treated therein.

These subjects comprised, amongst others, exhaustive recommendations as to the location and dimensions of the quarters for passengers and crew, the number of berths in each, and the provisions for their ventilation and cleansing; the location and dimensions of hospitals on board, and the proportionate number of sick berths for which provision should be made; the proportionate number of medical officers required; the professional records which such medical officers should be required to keep; the location and capacity of latrines; the number of attendants to be provided for passengers, and their duties as to policeing and cleansing quarters; the medical inspection of emigrants at foreign ports; vaccination; ventilation; bathing; and additional provisions for the personal health, cleanliness, and comfort of all on board.

Since the last report of this committee was submitted, a method of disinfection has come into somewhat extended use which seems to your committee especially adapted for employment on shipboard. This is the method of disinfection by the electrolysis of sea water. For disinfection by this process salt water or sea water is employed, the composition of which has been partially altered by the action of electricity.

This electrolysed sea water contains, probably as its chief active constituent, hypochlorous acid, a powerful deodorizer and bleaching liquid, and,—as has been proved by careful experiments made by Dr. Mark Armand Ruffer of the British Institute of Preventive Medicine, and others,—a true disinfectant or germicide as well. These properties are probably due to the united action of nascent oxygen and chlorine.

This process has been adopted for the disinfection of sewage at Worthing, Ipswich, and Lytham in England, and at the Netley hospital by the British war office; it is in use for the sanitation of Cape Town; it was placed on the Chargeurs Réunis Navigation Company's steamer, *Paraguay*, which conveyed some twelve hundred French troops to Madagascar.

[1] Presented at the Buffalo meeting of the Association, Sept. 15–18, 1896.

At the Boulogne-sur-Mer Health Exhibition last year a small automatic apparatus was shown for the making of the disinfecting fluid. Placed in connection with a cistern it keeps the salt water in it constantly electrolysed, automatically producing some three hundred litres per hour of the disinfectant, which is not only a powerful, but also a perfectly harmless fluid. To install this apparatus is not more difficult than to put in an additional electric lamp, since it has only to be placed in connection with the electric current by two small wires. The cost of this automatic apparatus is quite moderate; the expense of the electric current cannot be anything but small, and the supply of salt water offers neither trouble nor expense to sea-going vessels.

All modern vessels are provided with electric lights. For sea-going vessels, and particularly for those carrying emigrants, this system of sanitation seems especially applicable. On board such vessels large quantities of expensive and often malodorous disinfectants are in frequent use, and nevertheless strong, disagreeable, and unhealthy odors only too often prevail.

The use of such an automatic apparatus for the electrolysing of sea water to be used for the flushing of latrines, the drenching of sick-bays and steerages, the flooding of decks and alley-ways, etc., would constitute not only a great advantage for the health of passengers and crew, but would at the same time be a considerable saving of expense.

DISCUSSION ON THE REPORT OF THE COMMITTEE ON STEAMSHIP AND STEAMBOAT SANITATION.

Dr. Henry B. Horlbeck, of Charleston, S. C.—In reference to the matter of steamboat sanitation, sufficient attention has not been paid to steamers along the Atlantic coast that carry passengers. As far as I have noticed, there is a great lack of proper ventilation. There is not a sufficient supply of fresh air, which is so abundant and ought to be had. I have observed that while the cabins are well-equipped, and well-appointed in every respect, when the wind was on the wrong side the passengers got hardly a breath of fresh air. Many delicate children and women are forced to remain many hours at a time in these cabins during the voyage, and they are absolutely denied fresh air. I have discussed the matter with one or two captains, and they have remarked that it is a curious fact that ship-builders have not invented or devised some means whereby the passengers could get the benefit of more fresh air. One suggested that if a double deck were made on top, the ventilation would be much better, and it would also act in an admirable way in getting rid of foul air.

I have traveled all along the Atlantic coast from time to time, and I have yet to see a single cabin with the proper appliances for good ventilation. This matter ought to be remedied in the future construction of steamships. I know of a ship recently built that has wide and handsome

cabins, yet there is no ventilation except through the doorway and one small window, this being the only way to get a breath of fresh air. In bad weather, when the wind is on the other side, passengers have to remain in their berths for hours without any fresh air free from their own exhalation, and when the temperature is high the state-rooms become almost unbearable.

Dr. Albert L. Gihon, U. S. Navy.—Dr. Horlbeck's remarks regarding coast-line steamers suggest an experience of my own in the history of this Association, when we met in the city of Charleston. With my detestation of Pullman cars, which I believe to be one of the sanitary opprobria of this age, I determined to go to Charleston by steamer, and found myself a fellow passenger with some twenty or more consumptives on their way to Florida. It was the beginning of the month of December, when the temperature was pleasant, and there was every reason why the ventilation should be good. But these passengers insisted on having a hot fire placed in the saloon. Some of them went about and devoted themselves to closing the windows, while others expectorated all around a red hot stove, so that the sputum quickly dried and was disseminated through the air. I did not stay in that room any longer than I could help. The odor was very disagreeable, and although I remonstrated with the captain he said he could do nothing under the circumstances. These misguided, ignorant passengers insisted on shutting themselves up in this over-heated, abominably infected atmosphere. This illustrates the terrible dangers incurred by passengers in traveling on these coast-line steamers.

REPORT OF CHAIRMAN OF COMMITTEE ON POLLUTION OF WATER SUPPLIES.[1]

By CHARLES SMART, M. D., Major and Surgeon U. S. A., Washington, D. C.

It is my duty this morning to report on behalf of the committee on the Pollution of Water Supplies. At our meeting in Montreal, I was appointed chairman of this committee with authority to select associates; but although two years have elapsed since that time, the organization of the committee remains unfinished. This has not been on account of want of interest or want of effort, but on account of difficulties encountered in the work of forming such a committee as was desired by the Association.

For many years prior to the Montreal meeting I had been a member of the Water Committee, and during all that time I looked at questions of purity and impurity of water supplies from the standpoint of sanitary chemistry. Bacteriology, however, was coming to the front, and a careful survey of the field was necessary to determine whether the methods of the sanitary analysts should not be altered and their test tubes turned into culture tubes for the bacterial flora. I discussed this subject before you at our meeting in Milwaukee, and reached the conclusion that the bacteriologists at that time were as yet unable to deal single-handed with sanitary questions concerning water supplies. Nevertheless, the progress of bacteriological research was so rapid and the hope of practical sanitary results so great, that when the suggestion was made to me by our associates, Adami and Wyatt Johnston, of a coöperative bacteriological investigation, I accepted it promptly and embodied it in the report which I submitted at Montreal.

The Association approved of the proposition, and since then I have been endeavoring to carry it into effect. It was intended that the committee, when fully organized, should consist of all the bacteriologists who had laboratory facilities at command and were willing to engage in this systematic investigation into the wholesomeness of water supplies. Several earnest and able workers were present at the Montreal meeting: J. Geo. Adami of McGill University, Wyatt Johnston of the Provincial Board of Health of Quebec, J. J. McKenzie of the Provincial Board of Ontario, Geo. W. Fuller of the Lawrence, Mass., Experiment station, Gardiner T. Swartz of Rhode Island, and F. Ferguson of the New York hospital. All of these men recognized the great value of the proposed investigation. They knew that it would give an immense impetus to bacteriological work; that it would do much to clear away the confusion surrounding species, and to systematize and increase our knowledge; and that practical

[1]Presented at the Buffalo meeting of the Association, Sept. 15-18, 1896.

results might also be expected, particularly as regards the typhoid and colon bacilli, with a flood of light upon the wholesomeness of water supplies and a reduction in the death rate from enteric fever and diarrhœal diseases. They held several meetings and considered the details of the subject. They communicated with the various laboratories and found that the bacteriologists of the country were not only willing to participate in the investigation, but anxious for the inception of the undertaking. Had no obstacle of a technical character been encountered the coöperative investigation would have been in full progress in all the notable laboratories of North America within three months of the meeting at Montreal. Certain bacteriologists of large experience and more than national repute, whose current duties prevented them from participating in laboratory work, heartily agreed to act in the capacity of an advisory council to the committee in developing its work, and particularly in the consideration and settlement of difficult questions. This council consisted of five members: Surgeon-General George M. Sternberg of the Army, Professor Wm. H. Welch of Johns Hopkins University, Professor Victor C. Vaughan of Ann Arbor, Michigan, Professor T. Mitchell Prudden of the University of New York, and Professor Theobald Smith, then of the Agricultural Department, Washington, D. C.

Meanwhile, as it was evident that a work of this kind could not be carried on without a supply of funds in excess of that appropriated by the Executive Committee of this Association, an effort was made to find out how far some of our great insurance companies would sympathize practically in the undertaking. The Association had by resolution commended the proposed work to the favorable notice of state and local boards of health and all persons interested. Certain boards, by their secretaries, had stated their willingness to help financially when called upon, inasmuch as they recognized that money would be needed for printing, postage, expressage of cultures between laboratories, importation of cultures from Europe, and, probably, for the expenses of a convention of the leading men to settle uncertain points when everything that could be done by correspondence had been accomplished. It had been suggested by one member of the Association that the great insurance companies would subscribe liberally to any investigation which promised to lessen mortality and was sustained by the general sanitary voice of the country as expressed in the resolutions of the American Public Health Association. To verify this, I had interviews with Vice-President Alexander and the medical director of the Equitable Life, and with the medical officers of the Mutual Life of New York. I desired to know how the committee would probably be treated by the companies in case funds were required to carry on the work. The general tenor of the reply was not favorable, but in discussing the subject, it was readily conceded that if one of the big companies would subscribe, the others would speedily fall into line. However, no formal application was made

to the companies nor to any one else. The intention was to make such an application only when the committee was ready to go on with its laboratory work.

But the committee is not even now prepared to go on with its laboratory work. It met with a set-back at the outset. It discovered that the laboratory methods varied so much that nothing could be accomplished by collaboration until standard methods were devised and adopted. To settle all unsettled points and decide upon these methods, a convention of bacteriologists was called and met in New York city in June of last year. The papers read at the convention and the report of the proceedings are given in full in the October issue of our *Journal*. From it you may learn that the convention, notwithstanding the earnestness of its members, failed to accomplish the work of formulating the standard laboratory methods. Many of the points at issue were so delicate that they could not be weighed on presentation and brought to an immediate vote. The convention, therefore, turned over its responsibilities to a committee and agreed to accept the report and methods of the committee as its own, to be promulgated among the bacteriologists and referred to the Water Committee of the American Public Health Association, which had called the convention into being. This committee of the bacteriological convention consisted of Professor Adami of McGill University, Professor Abbott of the University of Pennsylvania, George W. Fuller, of the Louisville Water Co., Dr. Cheesman of New York, Professor Sedgwick of the Massachusetts Institute of Technology, Professor Smith of the Bussey Institute, Massachusetts, Professor Welch of Johns Hopkins, Baltimore, and myself; and I here present to the Association its report:

"Recommendations of a committee of American bacteriologists appointed by the convention of bacteriologists (called together in New York in June, 1895, under the auspices of the American Public Health Association) to draw up a scheme of tests to be employed in the study and description of species of bacteria."

This report was drafted by Professor Adami from the materials supplied by the convention and other special memoranda brought forward at a meeting of the committee in New York in February last, and was then submitted in turn to each of the members for criticism and amendment. It is as yet unfinished, as it has to pass through the hands of Dr. Cheesman and Professor Welch. This work, to the perfection of which so many minds and so much bacteriological experience have contributed, must be regarded as manuscript which will mark a period in the history of bacteriology. Your committee feels proud in presenting it and confident that it will reflect credit on American bacteriologists and on this Association, which provided the official facilities for its development and maturation.

When the standard methods of the convention are in the hands of the

bacteriologists of this country and time has been afforded them for consideration, the Water Committee of this Association will then be in condition to define its lines of action for effecting an organization for coöperative work, as suggested at Montreal. Your committee has had much experience since then, much experience of the difficulties that lie in the way of effecting such an organization. On this side of the Atlantic the bacteriologists who have the necessary experience are in positions where executive duties take up much of their time, and the younger men are employed for a specific line of work other than on water supplies. The delay of two years in determining methods has given the bacteriologists time to realize the amount of work involved in a coöperative investigation, and has probably permitted the enthusiasm of many towards the proposed work to subside as other subjects attracted attention. This will increase the difficulty of effecting an organization; but the earnest volunteer work done by our bacteriologists as shown in the proceedings of the convention and in this report of its committee, emboldens your committee on the Pollution of Water Supplies to believe that it may be able hereafter to go further in connection with the bacterial flora of water supplies than the mere development of the standard laboratory methods by which that flora is to be studied.

REPORT OF THE COMMITTEE ON RIVER CONSERVANCY BOARDS OF SUPERVISION.[1]

Your Committee on River Conservancy Boards of Supervision begs leave to report that it has been engaged in the work of collecting data upon which to formulate conclusions which may be of practical value, and to this end desires to present the following report as a report of progress.

The extent of scientific progress on this continent, as well as the growth and extent of its development, may be gathered from the fact that, according to the Manual of American Water-Works, while there were in 1800 only sixteen public water-works in the United States and Canada, there were in 1891 public water supplies or waters available for the residents of 2,187 towns in the United States and 95 in Canada supplied from 2,132 water-works systems.

There were in 1890, according to the same authority, only 3,168,461 people on the works in the United States, although 36 per cent. of the total population, 65,000,000, were residents of these cities. The fact that in a large proportion of the smaller cities and towns, notably those where public water companies control the water, a large percentage of private wells are still in use, has a most important bearing upon the comparative wholesomeness of the public water supplies of different cities, as judged by the deaths from typhoid or malarial fever during a series of years.

Thus in one of the cities of Ontario, amongst the most progressive in sanitary matters, with public water-works for some eight years, there are some 1,700 services in a population of 15,000, and divided according to wards as follows:

No. 1.	. . . . .	1 taker to	10	persons.
No. 2.	. . . . .	1 "	7½	"
No. 3.	. . . . .	1 "	5	"
No. 4.	. . . . .	1 "	19	"
No. 5.	. . . . .	1 "	14	"

Again, in a Pennsylvania town of 12,000 population, water consumers are reported at 3,000 and a heavy mortality, and in a Wisconsin town of 7,000 population there were but 697 takers.

An endeavor has been made to supplement statistical information obtained from the report already referred to by the issuance of the following circular, through the state officers of the different states.

[1] Presented at the Buffalo meeting of the Association, September 15–18, 1896.

A CIRCULAR LETTER.

Addressed to State and Municipal Health Authorities by the Committee on River Conservancy Boards of Supervision of the American Public Health Association.

TORONTO, July 15, 1896.

DEAR SIR: You are aware that the matter of River Conservancy Boards of Supervision was referred last year, at the Denver meeting, to a Committee, with instructions to it to report progress in the matter at this year's meeting. With a view to making practical suggestions the Committee is desirous of obtaining as much information as possible, both with regard to the extent of the local pollution of streams, and of the measures which are being taken to deal with the pollution of public water supplies, either by state or interstate supervision, by the coöperation of adjoining municipalities, or by local municipal efforts.

With this object, the Committee sends to you, as to other state officers, a number of copies of this circular, with the request that you will either distribute it to the officers of those towns and cities within your jurisdiction, situated on international, interstate, or interprovincial streams, or supply from your own returns the information asked for. The Committee hopes that such information as is available will be forwarded for its use to the chairman at the earliest convenient moment.

Trusting that the Committee are not asking more than the circumstances demand we remain,

Your very obedient servants,

Dr. P. H. BRYCE, *Chairman*, Toronto.
Dr. C. O. PROBST, Columbus, Ohio.
RUDOLPH HERING, C. E., New York.

To the City Officer:

DEAR DOCTOR: The Secretary of your State Board has been good enough to forward this circular to you, and the Committee asks that you supply it with answers to the following questions in addition to information with regard to your city already in the hands of the Committee.

Yours sincerely,
(Signed) P. H. BRYCE,
Chairman.

1. Give the name of your city or town and the sources of pollution, if any, to which your public water supply is exposed.
2. Give an estimate of the degree of pollution of the source of supply by sewage, by stating:
(*a*) The rapidity of stream per hour.
(*b*) The flow of water of stream per cubic foot per minute.
(*c*) And the amount of sewage per diem poured into the stream above the intake (1) within two miles; (2) within five miles; and (3) within ten miles distance.
3. Give population in 1891 and 1895, and the yearly deaths from typhoid or malaria for the five years; also the number of takers of public water.
4. State nature of soil along river banks above supply, and supply any single, or series of, analyses, chemical or biological, of the river water before and after filtration, during the above years.
5. You are requested very especially to give your views as to what practical measures ought to be adopted to deal with the question of supplying our cities and towns with pure water. Please make your suggestions:
(*a*) With regard to municipal legislation and action.
(*b*) State supervision and control.
(*c*) Interstate and international supervision or control.

(Signature and official title of Correspondent)

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From several states very satisfactory replies from town health officers have been received.

As stated in the circular, it was the desire of your committee to obtain some idea of the extent to which the position of several cities and towns

upon the same streams might seem to demand that some common action be taken by them with regard to the disposal of sewage and the protection of their public water supplies from pollution, or of associating together in one common water supply. The extent of this question may be gauged from the fact that 25 per cent. of the principal rivers of the United States and Canada form either international, interstate, or interprovincial boundaries,—and this apart from the Great Lakes—or flow from one state into another. Further, forty-two states and provinces are individually concerned in this vital matter. Below are given the states and the principal interstate, or interprovincial, streams.

St. John, between New Brunswick and Maine.

Connecticut, between New Hampshire and Vermont.

Merrimack, from New Hampshire into Massachusetts.

Connecticut, from Massachusetts into Connecticut.

St. Lawrence, between Ontario and New York.

Delaware, between New Jersey and Pennsylvania.

Hudson, between New York and New Jersey.

Delaware, between New Jersey and Pennsylvania.

Alleghany, from Pennsylvania into Ohio.

Susquehanna, from Pennsylvania into Maryland.

Ohio, between West Virginia and Ohio, Kentucky and Ohio, Kentucky and Illinois.

Tennessee, from Alabama into Tennessee.

Ohio, between Kentucky and Indiana.

Detroit, between Michigan and Ontario.

St. Mary's, between Michigan and Canada.

Niagara, between Ontario and New York.

Mississippi, between Wisconsin and Minnesota, Illinois and Iowa, Tennessee and Arkansas, Mississippi and Louisiana.

Missouri, between Iowa and Nebraska, Missouri and Kansas, from Dakota into South Dakota, from Montana into Dakota.

Red River of the North, from North Dakota into Manitoba.

Savannah, between Georgia and South Carolina.

Arkansas, from Indian Territory into Arkansas, and from Colorado and Kansas.

Rio Grande, between Texas and Mexico.

Colorado, from Nevada into California.

Columbia, between Washington and Oregon, from British Columbia into Washington.

Ottawa, between Ontario and Quebec.

That many of the cities and towns of America, by selecting lakes, springs, or artesian wells, have either temporarily or permanently removed from themselves the immediate dangers of real pollution may be gathered from the following table made up with such accuracy as was possible from the available data:

WATER SUPPLIES OF CERTAIN PLACES.

Place.	River or brook.	Springs, wells, or lakes.	Gravity.	Pumping.	Filtered.
Vermont	10	20	25	5	
Massachusetts	38	80	49	69	9
New York	68	99	84	83	16
Connecticut	29	20	38	11	3
Rhode Island	6	6	2	10	3
New Hampshire	11	27	26	12	
New Jersey	25	27	12	40	5
Delaware	2	4		6	
Maryland	2	12	5	9	
Virginia	9	27	16	20	
West Virginia	5	4	3	6	
North Carolina	5	10	3	12	2
South Carolina	2	3		5	
Georgia	3	20	2	21	1
Florida		10	3	7	
Alabama	6	15	3	18	1
Mississippi	3	6	2	7	
Pennsylvania	92	101	94	99	12
Missouri	22	13	2	33	10
Arkansas	6	8	1	13	2
Texas	22	32	1	53	7
Colorado	27	23	33	17	2
New Mexico	1	7	3	5	1
Washington	6	27	20	13	
Oregon	12	13	12	13	
California	32	62	51	43	2
Arizona	2	1	1	2	1
Nevada	4	5	8	1	
Utah	3	4	6	1	1
Idaho	3	7	6	4	
Louisiana	2	2		4	
Tennessee	7	8	2	13	1
Kentucky	15	9	1	23	1
Ohio	29	53	6	76	6
Indiana	19	28		47	8
Michigan	35	73	2	106	13
Illinois	26	67	1	92	13
Wisconsin	14	34	6	42	6
Iowa	23	51	3	71	14
Minnesota	15	19	1	33	2
Kansas	20	53	1	72	15
Nebraska	11	49	2	58	3
South Dakota	3	20	14	9	1
North Dakota	4	3	3	4	
Wyoming	5	3	6	2	
Montana	8	4	7	5	1
	692	1,169	566	1,183	172

Thus from these tables it would appear that 692 towns and cities obtain their public water supplies from rivers and brooks, and 1,169, from lakes, ponds, artesian or other wells, or reservoirs.

Your committee, therefore, desires to point out the extreme importance of the problem which has been delegated to it; and, while it cannot fail to realize the many practical difficulties in the way of recommending to this association any single line of action, it has endeavored to examine some of the principal elements which must necessarily enter into its consideration.

1. The first problem, while not greatest in practical importance, is necessarily, owing to its nature, that which must take precedence. It is that of *international streams.* As yet only the streams forming the international boundaries between the United States and Canada are those which demand consideration. On the great water-ways between these two countries have grown, within the last twenty-five years, a number of large cities and towns, which have gone to these great reservoirs of pure, cold water for their supplies, and which must, apparently, continue to use them for all time, owing to the absence of other available supplies.

From the east there are the St. Lawrence, the Niagara, the Detroit, the St. Mary's river, the Red River of the North, and the Columbia, which two latter rise, one in the United States and the other in Canada, and flow into the other country. Practical dangers at present probably attach only to three of these, viz.: the Niagara, the Detroit, and the Red River of the North, although a singular outbreak of typhoid has already been reported, caused by shipping anchored over or near the intake of the town of St. Mary's at the "Soo." All of these streams receive the sewage from the towns on their banks, and already Detroit is seeking to determine the possible dangers which may arise to her supply from the towns and cities pouring sewage into Lake St. Clair on the Canada side; and the analyst of Buffalo refers to the possible dangers to that city from the Grand river of Canada. On the other hand, these two cities pour the sewage from about 500,000 people into the Detroit and Niagara rivers, to the detriment of towns below them on either bank. In addition, garbage boats and river dredges have till recently made, or are now making, these streams convenient receptacles for their refuse from both Detroit and Buffalo, resulting in seizures by the Canadian authorities for infringement of Canadian laws by dumping into Canada waters. The report of the chief officer of health for Manitoba points out that, in addition to that of Canadian towns, the Red River receives the sewage and refuse of several growing Dakota cities.

2. The second and, without doubt, the most serious pollution as yet is *pollution of interstate and interprovincial streams.* The number of rivers, and of states interested has already been mentioned. The extent of the pollution and the vital interests involved are enormous.

Of all of these rivers, probably the Ohio ranks first in importance, not

alone from the great length of the stream and from the large number of cities and towns on its banks, the number (five) of states interested, but also from the fact that its long course through a prairie country precludes the possibility of other sources of supply for many of the cities along its banks.

3. The third class of difficulties, that of the *pollution of intrastate streams*, while not possessing the same practical difficulties in being dealt with as regards legislation, presents, nevertheless, the same problems as regards scientific methods for remedying existing evils.

The difficulties presented by the problem are essentially three:

1. Legislative and legal; 2. Scientific; 3. Financial.

Undoubtedly, the legislative problem is a most formidable one. While it is true that a number of states have made legislative enactments with a view to controlling intrastate pollution of streams, yet even in these, the work done has been almost wholly with the end of preventing further pollution. So far as interstate legislation is concerned, there has not been, so far as your committee is aware, any instance where common legislative action has been taken to preserve streams even in their present state of purity.

With only the recent assumption by the federal authorities of the control of international streams, except from the standpoint of customs and fishery rights, it is natural that the questions of lake and river levels and of sanitary control should as yet scarcely have been thought of. That joint action in the matter of sanitary control may be naturally demanded and expected, may be argued from the joint action in the preservation of the fisheries, as in the Behring Sea seal fishery; from the International Park Commission for the preservation of Niagara Falls; and from the international action now being taken to determine practical methods for maintaining the water level of the great international water-way from Lake Superior to the ocean.

The second difficulty may be called the scientific one. Legislators may naturally ask, Are the views of sanitarians and engineers now so well determined, so positively in accord as to positive dangers from the pollution of even large bodies of water and as to existing methods for the prevention of such pollution, as that they would be able to present practical schemes for dealing with the question of pollution, say of the Niagara river? That such methods exist may very well be concluded from the work of the standing committee on pollution of streams, and the resolutions expressing sympathy in its work, passed by the Society of Water-works Engineers.

The third difficulty, assuming that the first two could be met, is the financial one. Taking the Niagara river as a familiar illustration, the problem may be asked, What practical means could be employed for determining the relative tax which should be levied on the several municipalities depending upon it for a supply of water? It is manifest that

from the individual municipal standpoint, the city of Buffalo, at present the chief factor in this pollution, is, of all, the least interested from the standpoint of personal safety in maintaining the purity of the stream. Nevertheless, if state control over the use or abuse of the stream exists, if, further, federal jurisdiction can prevail to protect the river, some *methodus agendi* could be found, whereby the respective rights and responsibilities, municipal, state, and federal, could be determined.

While instances exist where a number of municipalities interested in the conservation of a common water supply have united, to their mutual benefit, as notably the several towns and cities of Massachusetts surrounding Boston, yet the common case is that of a stream like the Niagara, where the advantage of position of one town is so great as to cause it naturally to be unwilling to tax itself directly for the indirect advantage which may come to it of having healthy neighbors. We may expect, therefore, unless that social evolution has been attained which makes a higher rule of action take precedence over individual or municipal selfishness, that such a city would be averse to seriously considering the problem. We must, therefore, look to the exercise of the assumed intrinsic right of control by the state for the protection equally of all its citizens and the preventing of one municipality from doing injury to the lives and interests of others. The principle need only be extended and we logically assume the right of the federal power to require neighboring states bordering on the same streams to preserve in the interests of one another these streams in a state of purity compatible with the well-being of the people at large.

By a natural process we arrive at the point where neighboring, friendly nations will desire to discuss in an amicable manner those pollutions which may be productive of dangers to the lives of the people of each other, and will look upon such international arrangements for the supervision and patrol of these boundary streams as carefully as they prevent poaching upon each other's fishing grounds, or discuss schemes for maintaining the lake levels for purposes of navigation.

Your committee is not as yet prepared with such data regarding individual cases of pollution as to enable it to present practical suggestions with regard to a conservancy board for any particular stream, but desires, if continued, by laboring in conjunction with your standing committee on pollution of streams, and various engineering associations, to collect material which in another year may give to the committee's report some practical value. All of which is respectfully submitted.

P. H. Bryce,
C. O. Probst,
Rudolph Hering,
Committee.

APPENDIX.

Replies to the circular sent out have been received from thirty cities, many of them being accompanied with extended tables, in answer to some of the questions. Your committee, from these returns, has selected that made by the engineer of the water-works of the city of Philadelphia as being noteworthy, not more for the interesting information it contains than for the valuable opinions it contains of the importance of the work, which has been delegated to your committee.

DEPARTMENT OF PUBLIC WORKS,
BUREAU OF WATER,
PHILADELPHIA, Aug. 19, 1896.

Dr. William H. Ford, President Board of Health, 610 City Hall, Philadelphia:

DEAR SIR: In reply to your favor of the 7th inst., transmitting a letter from Dr. Benjamin Lee, secretary of State Board of Health, with printed circular letter of enquiry from the Committee on River Conservancy Boards of Supervision of the American Public Health Association, I beg to report as follows, referring by number to the five queries of the committee:

"1. Give the name of your city or town, and the sources of pollution, if any, to which your public water supply is exposed."

In addition to what you have said in reply, I might remark that the Schuylkill river, from which we draw about 90 per cent. of our entire supply, rises in the anthracite coal regions of Pennsylvania, and its upper waters are therefore subject to pollution by the water pumped from the mines and by the coal dust carried in from the breakers, many of which now use water in the purification of the coal, and from the numerous washeries established during recent years for working the heaps of culm accumulated since the commencement of mining.[1]

Pottsville, the centre of the Schuylkill anthracite region, a town of 14,000 inhabitants, lies upon the river, and, together with Tamaqua, Minersville, and many smaller towns, helps to pollute the stream.

Below Pottsville are important manufacturing towns, including the following:

Reading	59,000
Pottstown	13,000
Phoenixville	8,500
Norristown	20,000
Conshohocken	5,500

[1] During heavy general floods the water taken at Philadelphia is rendered almost inky by coal dust from these sources.

Below Conshohocken, the Schuylkill river flows for several miles past portions of the city itself, including the important manufacturing centres, Manayunk and Falls of Schuylkill. Below these are the crowded Laurel Hill cemeteries.

About eight years ago an intercepting sewer along the left bank of the Schuylkill was constructed by the city for the purpose of keeping from the river the discharges of those manufacturing places within its limits. This, and the extension, in 1860–'70, of Fairmount park, through which the Schuylkill river now flows for some three miles before reaching tide-water, effectually protect that portion of the stream.

The lowest dam on the Schuylkill is that at Fairmount, at the lower end of Fairmount park and near the central portion of the city. This dam is now the head of tide-water. Seven miles above this is Flat Rock dam. From the pools formed by these two dams all the water drawn by the city from the Schuylkill (that is to say, nine tenths of the city's entire supply) is taken.

On the lower, or Fairmount pool, we have the following works:

	Ave. daily pumpage in millions of U. S. gallons, 1895.
Fairmount (turbines)	21
Spring Garden (steam)	139
Belmont (steam)	23

Queen Lane (steam, unfinished), four pumps of 20,000,000 gallons' capacity each.

On the upper, or Flat Rock pool, we have,—

Roxborough station, ave. daily pumpage in 1895, 17,000,000 U. S. gallons.

The Delaware river, a stream of many times greater discharge, flows through a district relatively sparsely settled, with few large manufacturing towns besides Trenton, about thirty miles above Philadelphia. On the other hand, its waters being tidal as far up as Trenton, and there being no dams in that distance, the water taken from it for the city is more or less subject to pollution from the city's own sewage. The pumping station is on the city's side of the river, about eight miles above the centre of the city and about four miles above its densely populated portion, but about one mile below the house of correction, which stands at the mouth of the Pennypack, a tributary stream.

"2. Give an estimate of the degree of pollution of the source of supply by sewage, by stating,—

"(a) The rapidity of stream per hour.

"(b) The flow of water of stream per cubic foot per minute.

"(c) And the amount of sewage per diem poured into the stream above the intake,—1st, within two miles; 2d, within five miles; and 3d, within ten miles distance."

(a) and (b) I quote as follows from my annual report to the director of the department of public works for 1895:

"Mr. Edwin F. Smith, superintendent and engineer of the Schuylkill Navigation Company, from careful weir measurements at Pawling's dam, the first below Phoenixville, the second above Norristown, and about a mile below the mouth of the Perkiomen, estimates the daily flow at Fairmount, from October 8th to 31st, at only 191,649,021 gallons. This is probably but little greater than the minimum flow."

Mr. Smith adds,—"Below Pawling's there should be subtracted from the figures I have given you, about 5,000,000 gallons a day for Norristown, and 3,000,000 gallons a day for Conshohocken, including the pumping stations and the manufacturing industries of those towns. For the whole valley the quantity abstracted daily, excluding Philadelphia, is about 25,000,000 gallons, and is constantly increasing."

Pawling's dam is twenty-three miles above the city, and several streams, including the Wissahickon, enter the river below it; but, on the other hand, Norristown and Conshohocken draw their supplies from the river. We may, therefore, take the minimum daily flow reaching our uppermost or Roxborough pumping station, in round numbers, at 200,000,000 gallons.

As to the average daily flow, I quote as follows from my report for 1895:

"The computed flow of the Schuylkill for 1895 was 368,306,402,874 gallons, giving a daily average of 1,010,000,000 gallons.

"The total flow, as thus stated, is made up as follows:

"Total flow over flash-boards . .	69,359,757,440	gallons.
"Total steam pumpage . . .	71,188,655,893	"
"Total water pumpage . . .	7,587,193,211	"
"Water power	227,615,796,330	"
"Leakage at dam and locks . .	2,555,000,000	"
"Total	368,306,402,874	"

"The flow over the flash-boards was computed by Francis' weir formula from the daily reported head over the flash-boards.

"The steam and water pumpages are taken from the report of the general superintendent, where they are given as deduced from plunger displacements.

"The water-power used at Fairmount is based upon the assumption that 30 gallons of water pass through the turbines for each gallon raised into the reservoir.

"The leakage given comprises the lockage through the locks of the Schuylkill Navigation Company, on the west side of the river, and the quantity which escapes through the gates while the turbines are not running, and through the locks of the Schuylkill Navigation Company.

"All of these items are subject to grave uncertainty, more particularly

the first and the last, the last being little better than guess-work. We may, however, take one billion gallons per day as the average flow at Fairmount."

Owing to the division of the river into pools and rapids, it would be idle to attempt to deduce from these estimates of flow the mean velocity of the river.

The average flow of the Delaware at Philadelphia during June, July, August, September, and October, 1895, as estimated by the United States Engineer's office here, from its gaugings above Trenton, was 333,333 cubic feet per minute, or 3,360 million gallons per day.

(c) I know of no way by which I can presently arrive at even an approximate estimate of the amount of sewage entering either the Delaware or the Schuylkill.

"4. State nature of soil along river banks above supply, and supply any single, or series of, analyses, chemical or biological, of the river water before and after filtration, during the above years."

The Schuylkill, in the anthracite regions in which it rises, flows, of course, through the carboniferous series, and generally over rocky and barren or wooded country. Below the Blue Mountain gap, at Port Clinton, its course is principally through fertile, undulating, farming country, intersected by generally parallel ranges of wooded hills. Between Port Clinton and the hills (of Cambrian formation) at Reading, it flows first, for ten or twelve miles, through a valley of Trenton limestone. Between Reading and Norristown, a distance of nearly forty miles, the valley is in the broad belt of "new red" or mesozoic sandstone. The deep red soil of this region contributes large quantities of mud to the river after every heavy general rain in the lower valley of the river. Below this is a narrow Trenton limestone valley, and the river then enters the belt of gneisses upon which the city is built.

The Delaware rises in mountainous, uncultivated regions of Pocono sandstone in and beyond the northeastern section of the state. At Stroudsburg it passes through the Blue Mountain, cut by the Schuylkill at Port Clinton, and then traverses, in general, the same series of formations as the Schuylkill. Below Trenton the country for some distance back from its banks is generally quite flat as compared with that adjoining the Schuylkill. Being a much larger stream, the Delaware is less affected, as regards the quality of its water, by the character of the country through which it flows. Nevertheless, after heavy rains, its water also is quite turbid, and during the winter of 1895–'96, for the first time on record, its water, at our intake, was heavily discolored by anthracite coal dust from the Lehigh coal regions.

I transmit herewith five large blue prints of tables compiled from all the sources of information of which I could learn, giving chemical and biological analyses of our waters. The two diagrams are plotted from a

Report on the Results of an Examination of the Water Supply of Philadelphia, by Dr. J. H. Wright, embodied in "The Bacteria of River Waters," by Dr. John S. Billings, National Academy of Sciences, Vol. VII, Third Memoir. Dr. Wright's paper embraces other tables, not included in the accompanying blue prints. Filtration has not yet been applied to our waters, except upon a small and purely experimental scale.

"You are requested very especially to give your views as to what practical measures ought to be adopted to deal with the question of supplying our cities and towns with pure water. Please make your suggestions,—

"(a) With regard to municipal legislation and action.

"(b) State supervision and control.

"(c) Interstate and international supervision or control."

This question, involving, as it does, many legal questions, is one which I find very difficult to answer to my satisfaction. Yet it is one upon which very much might be said. Furthermore, the nature of the reply must change rapidly from time to time with the rapidly changing character of our industrial, economic, and social conditions. Less than a century ago public water-works for cities were scarcely thought of in this country, and even within the last one or two decades the development of public water-works has been enormous.

Under our present conditions we seek to impose upon our streams two burdens, both of which seem to be natural to them, and yet it is impossible for the stream to perform both satisfactorily. At first sight it would seem, especially from the point of view of the water-works engineer, that the absolute purity of the streams should, at all hazards, be maintained, so that they might become and remain satisfactory sources of water supply; for prevention is better than cure, and innocence than repentance. But it must be borne in mind that this would heavily handicap many of our manufacturing industries, and would enormously increase the difficulties of the drainage of cities and rural districts and the sewerage of cities.

Undoubtedly the not-far-distant future will witness great extensions in the power of state, if not of national, control over our streams and watersheds, particularly with regard to forest conservation. Indeed, when a city finds it necessary to go to a distance for its supply, it seems only ordinary business management that it should seek to secure the coöperation of other communities along the line of its conduit, or in its own neighborhood. Boston has already set an example in this respect by inaugurating its new system of "metropolitan" water supply, and thus, as municipal has supplanted private supply, state supply, or something approaching it, seems destined to supplant municipal supply.

In my annual report for 1895, already quoted, referring to a plan for improving the Schuylkill supply by impounding its upper waters, I remarked,—

"The legal controversies in which the prosecution of such a plan would involve the city with other communities affected, suggest the advisability of placing all the streams of the state under the control of the state itself. Boston and the neighboring towns have already inaugurated a metropolitan water supply for their common benefit; and it would seem that the ultimate outcome of the present conditions must be the establishment of state, if not national, systems of water supply."

Much regretting that the necessity of submitting my reply at the earliest possible moment, and the extreme pressure of other duties, forbid a more satisfactory and more carefully matured reply to the queries put by the committee, I remain,

Very respectfully yours,

JOHN C. TRAUTEVINE, JR.,

Chief of Bureau.

REPORT OF THE COMMITTEE ON ANIMAL DISEASES AND ANIMAL FOOD.[1]

By D. E. SALMON, D. V. M.,

Chief of the Bureau of Animal Industry, Washington, D. C., Chairman.

Your committee has the honor to report improvement in the conditions obtaining in the United States, relative to the important subject of animal diseases and animal food. Animal diseases are now more intelligently managed by sanitary officers than ever before, and the meat-inspection service has been steadily extended and perfected. In a general way there has, consequently, been satisfactory progress; but we must admit that there is still much to be accomplished in the way of educating the public, and in the application of sanitary science. Your attention is, therefore, invited to a few points which are brought to mind by events occurring during the past year.

Outbreaks of anthrax among the domesticated animals are apparently becoming more frequent. This disease, very common in the old world, has been rare and confined to small areas on this continent. Unfortunately, the contagion, once introduced into a pasture, remains indefinitely. The bacillus forms spores, and these spores may retain their vitality and virulence for many years. During this long and indefinite period they remain in the soil, ready to start up another outbreak when favorable conditions exist. A disease so fatal to man and beast should be promptly repressed whenever it makes its appearance, and precautions observed to prevent infection of new territory.

The presence of this disease has been reported during the year in a number of states, and it is generally found that there has been unpardonable carelessness in reference to the carcasses of animals which have died. Sometimes they have been left in the fields to be devoured by carniverous insects, mammals, and birds; sometimes they have been thrown into the streams or ponds; and sometimes they have been buried in the pastures. If the object were to spread and perpetuate the infection, it would be hardly possible to adopt a more effectual plan. Flies feeding upon the carcasses have their probosis soiled with infectious material, and when they afterwards puncture the skin of a healthy animal they inoculate the contagion, and the result is an anthrax tumor. Dogs carry parts of the carcasses to distant pastures, and these animals and swine may contract the plague by feeding upon such carcasses. Possibly the spores of the bacilli pass through the intestinal canal of birds and are scattered with their excrement. The germ may multiply in ponds; it is carried by streams; the spores which form in the carcasses may be carried to the surface over

[1] Presented at the Buffalo meeting of the Association, September 15–18, 1896.

the pits where these are buried and infect the grass which is growing there.

To avoid these sources of contagion, the carcasses, which should never be skinned, should be saturated with coal-oil and burned to ashes. Where this method of disposal has been thoroughly enforced, and the animals have been kept away from infected pastures and yards, the outbreaks have been quickly arrested.

New outbreaks are generally due to contagion carried in hides imported for tanning, or in wool brought for manufacturing purposes, or in hay from infected grounds used in packing crockery and glassware. These sources of contagion should be guarded against by proper regulations. The federal government requires disinfection of imported hides from countries known to be infected, but such disinfection is difficult; its efficacy at best, for the destruction of this contagion, is open to question, and there is reason to believe that in exporting countries it is hastily and imperfectly performed.

The waste from tanneries and woollen mills should not be allowed to contaminate pastures, and hay from infected meadows should not be used even for packing. Local health boards must be relied upon to enforce such regulations, and should advise the owners of infected lands, that these may be reclaimed by drainage and cultivation.

The widespread prevalence of tuberculosis among dairy cattle is a subject now receiving serious consideration in various parts of the country. Measures for the eradication of this disease have been undertaken by a few states and by a considerable number of cities. The principal difficulties are due to the magnitude of the work and to the limited number of men who have had sufficient experience in making the tests. The use of tuberculin as a means of diagnosis is increasing, and the accuracy of this test is now thoroughly established by experience. The objections which have been raised to the tuberculin test by those opposed to any action looking to the control of tuberculosis in cows, have been shown by careful investigation to have little, if any, foundation. In the light of present knowledge, any effort for the eradication of tuberculosis in this field must be regarded as likely to prove ineffectual where the tuberculin test is not made the basis of the diagnosis.

The danger connected with the use of milk from tuberculous herds is emphasized by repeated instances where such milk has infected calves and swine to which it has been fed. When we reflect that in dairy herds from sixty to ninety per cent. of the animals may be tuberculous, it is readily seen that the milk of all large herds in this condition probably contains the bacilli, even though we admit that but a small proportion of affected cows yield infectious milk.

Tuberculous cows and tuberculous swine are often found in the abattoirs of the country, and sometimes there is great reluctance and even refusal on the part of the managers to properly dispose of the carcasses.

Your attention was invited a year ago to the importance, and, indeed, the necessity of coöperation between the federal inspectors and the local sanitary authorities in order to properly protect the health of consumers in all parts of the country. The federal law does not give sufficient authority for the destruction, as a food product, of diseased carcasses. It simply prohibits their shipment to other states. The Bureau of Animal Industry has, however, required condemned carcasses to be rendered in the fertilizer tanks, and most establishments have complied with this requirement, rather than have the public know that they would sell diseased and condemned meat to their customers. Occasionally, however, a firm is encountered which has apparently neither regard for the public health nor for its own reputation, and it insists upon its right to sell for local consumption the carcasses that are condemned. In these cases coöperation with the local health boards is invaluable and indispensable. These boards have undoubted authority to condemn and destroy diseased meat, and they can very easily make it to the advantage of any abattoir to comply with all reasonable sanitary requirements.

Such coöperation has been more easily secured and more effectual during the past year than ever before, and there are now only a very few abattoirs which are disposed to resist the tanking of condemned carcasses. These few must be made to realize that the time has passed when diseased meat can be freely sold for human food in this enlightened country. Your committee testifies with great pleasure to the cordial relations which have been established between the Bureau of Animal Industry and the several state and municipal boards of health, and believes that this is largely due to the influence of the American Public Health Association and to the consideration which has been given to this subject at its annual meetings.

It is a duty of this committee at this time to call attention to the subject of rabies or hydrophobia. We have a number of societies in this country which have recently been very active in disseminating the opinion that this disease either does not exist or that if it exists at all it is extremely rare. Unfortunately this opinion has been supported by letters from a number of prominent physicians, which letters have been given wide publicity in the newspapers. The tenor of these letters is to the effect that the writer had been in practice many years without seeing a case of hydrophobia, or that every case resembling this disease which he has seen could be explained upon some other hypothesis. He, therefore, deprecates the rumors and accounts of hydrophobia which appear in the public press, and believes such cases are forms of hysteria more due to fear of hydrophobia than to the absorption of animal virus.

While it is the duty of the physician to discourage exaggerated and sensational stories of disease, it is no less his duty to give the public correct and reliable information. The desirability of guarding the people from unnecessary alarm who are bitten by dogs, many of which are free

from rabies, should not prevent us from giving the information required to protect the much greater number who are liable to be bitten by animals which are actually rabid. The chairman of this committee found it desirable some years ago to combat in this Association the views of very worthy gentlemen who believed there was no such disease as the Texas fever of cattle. To-day there is no well-informed man who would think of contesting the existence of that disease.

Is it reasonable to suppose that a disease which has been known to medical literature for two thousand years, which originates in a certain definite manner, which has specific characters, and which may be inoculated from animal to animal with the greatest certainty can be blotted out and disposed of by the testimony of a few physicians who have never happened to see it? or, who, if they have seen it, have been unable to recognize it? Do we usually build up our science by the observations of men who have never seen the phenomena of which they write and who are confessedly ignorant of the subject?

On this disease we have sufficient positive evidence to establish its existence and characteristics. There are, in addition to the records of the disease in adults, in children, and in animals, caused by the bites of rabid dogs, also inoculation experiments covering a period of three quarters of a century and including the wonderfully successful investigations of Pasteur. The disease in animals and young children cannot be explained on the hypothesis of lyssophobia or hysteria from fear of the disease. Nor can we accept the statement that a disease with all the characteristics of rabies can be produced in animals by inoculation with inert or other non-specific material. Those who hold that this can be done are apparently unacquainted with the specific characteristics of this disease.

The chairman of this committee has had some opportunity to investigate the existence of rabies, more particularly in the District of Columbia, but also in other parts of the country, and instead of finding the disease to be very rare the cases among dogs and cattle have proved more numerous than was expected. It is recommended, therefore, that the measures for reducing the numbers of worthless dogs be vigorously continued by the various boards having jurisdiction, and that when outbreaks of rabies occur, regulations should be made requiring all dogs which are allowed upon the streets to be securely muzzled.

THE COMPOSITION AND INFECTIOUSNESS OF MILK.[1]

By J. F. KENNEDY, A. M., M. D.,
Secretary State Board of Health, Des Moines, Iowa.

When I determined, upon the invitation of your secretary, to present a paper at this meeting of the Association, I concluded that I would submit to you some observations upon "Animal Food," in general. However, as I began to investigate the subject, a field so wide, extensive, and inviting, opened up that I feared to enter, lest in roaming through its highways and by-ways, and reveling in its attractions and incidents, I should become prodigal of your time, and weary you with much speaking. Hence, I have selected as the subject of my paper, "The Composition and Infectiousness of Milk," believing that this one item of animal food will afford an opportunity to present, within reasonable time, some facts which, though not new to most of you, are worthy of being twice told. Indeed, the subject is of so much importance, and enters so much into our daily life, and is so universal in its application, that it cannot be too often, or too prominently, brought before the public.

For the purposes of this article, cows' milk alone will be considered, since no other kind of milk is used by many infants and adults; and since it is the almost universal and, under proper conditions, the best substitute for human milk in the feeding of children.

Cows' milk, according to Cameron, is composed of the following parts per 1,000,000:

Water		870,000
Fat	40,000	
Casein	41,000	
Sugar	42,800	
Salts	6,200	
Solids (not fat)	90,000	130,000
		1,000,000

It also contains gases in solution in the following proportions, in 30 parts per 1,000, in volume:

Oxygen	1.29
Nitrogen	12.17
Carbonic acid	16.54

It will thus be seen that pure, uncontaminated cows' milk contains, in practically proper proportions, all the elements of a perfect food. Human

[1] Presented at the Buffalo meeting of the Association, September 15–18, 1896.

milk, its closest analogue, is the only food prepared by nature for the most critical period of human life; and for nine to ten months all the marvelous developments of infancy are best promoted by the sole use of breast milk.

In adults, milk alone will sustain life longer than any known food. Drs. Coplin and Bevan, in their excellent "Manual of Practical Hygiene," say: "The writers are aware of a patient who lived three years upon three to five pints of milk daily, and a patient in the hospital of the Jefferson Medical College, suffering from carcinoma of the gullet, received three pints of milk daily, aud gained considerable weight and strength during the period of thirteen months."

The quantity of milk used in the United States annually, either in its original form or its products, butter and cheese, is enormous, and attests its importance as an article of food. Especially is it important because of the large number of infants who are artificially fed, and whose sole dependence for life itself is upon milk.

It is said that during the year 1895, in England and Wales, one fifth of the total deaths were children under one year old, and it has been shown that of this frightful mortality much the greater proportion were artificially fed children.

In Berlin, in giving the certificates of death of children under one year, the fact must be stated as to whether the child was fed from the breast or brought up artificially. In ten thousand deaths thus reported it was found that two thirds, or 7,646, were artificially fed.

Hope, in a series of investigations in England, discovered that only 3 per cent. of one thousand deaths occurred in infants that were breast fed; and Minert of Bavaria found in a similar investigation that, out of four hundred deaths of children from summer diarrhœa that came under his notice, 96 per cent. were fed artificially.

In view of these facts it is pertinent, therefore, to inquire whence come such direful results from the use of an article of food so well adapted by nature, in its normal condition, to the growth and development of the body?

The cause of quite a large number of deaths of these children artificially fed is inanition, the milk having been largely deprived of its nutritious properties by the addition of water, in many places commercial milk being diluted from 25 to 30 per cent.

This dilution is not only a fraud upon the buyer, but a great crime perpetrated upon the innocent child, who needs the milk, with its rich per cent. of butter-fat, as secreted by the udder, in order that it may grow and develop. If deprived of this essential element, instead of thus growing, the muscles become flaccid, the features haggard and pale, and, finally, literal starvation occurs.

Many states now have dairy laws which are intended to protect the people against this fraud of adulteration, and in some places the law is

measurably successful. Even where there is a rigid and apparently efficient inspection of milk, however, and the butter-fat is up to the per cent. prescribed, the inspection is not expected to reach further. The commercial rather than the sanitary interests of the consumer are guarded.

The design of this paper is to emphasize and intensify the importance of a sanitary inspection in addition to, if not to the exclusion of, the mere commercial examination. Indeed, a faithful sanitary inspection must of necessity exclude all adulterants, whether for the purpose of increasing the bulk or changing the quality of the milk.

But little effort has yet been made to determine the condition of the cattle giving the milk, whether healthy and free from any infectious disease; to examine the feed and water given the cows; the sanitary condition of the stables; the character of the water used for washing the cans, if not for diluting the milk; the sanitary condition of the milkman's family, and whether they have any infectious diseases; and the habits of those handling the milk, and the methods used in milking. All these are important conditions, which contribute greatly to the healthfulness or infectiousness of the milk.

The first thing of importance is to determine whether the animal furnishing the milk is healthy or not. If a corrupt fountain cannot send forth pure water, neither can a diseased cow secrete and furnish pure and wholesome milk.

An interesting report prepared by S. C. Busey, M. D., and G. M. Kober, M. D., of Washington, D. C., has recently been published by the health officer of the District of Columbia, for 1895, on "Morbific and Infectious Milk." The authors point out certain diseases of cows that affect the milk deleteriously, if not dangerously. Among those diseases which render the milk unfit for food, they cite the following affections: *Garget*, and inflammatory condition of the udder and teats; *gastro-enteric diseases; acute specific enteritis; puerperal and other septic fevers; foot and mouth disease; cowpox; anthrax; pleuro-pneumonia; rabies; tetanus;* and *tuberculosis*.

They proceed in their report to furnish ample proof of the infectious character of milk from cows affected with the foregoing diseases, and show that often loathesome and fatal sickness has arisen because of the use of milk thus infected.

It is said that about one seventh of all the deaths occurring in the world are from tuberculosis, and as it has been universally conceded that tuberculosis in man and cattle is identical, it is important to know to what extent this disease prevails among cattle. It is fair to assume that it is much more frequent than is believed. Avarice and commercial greed combine to secrete and minify the prevalence of the disease, and to weaken or prevent belief in the infectiousness of the milk and meat of such animals.

Despite this disposition to conceal the extent to which this disease

prevails, veterinarians and commissions are diligently and successfully turning on the search-light of investigation, and already some interesting facts have been discovered.

Fleming says: "Tubercular phthisis, or tuberculosis, probably prevails among domesticated animals over the entire globe, though its frequency will depend upon various external influences, as well as the constitutional tendencies of different species and breeds. In some countries it is enzoötic and very destructive. In Mexico, for instance, it is very common and causes much loss, about 34 per cent. of the animals slaughtered for food being found affected.

In France, M. Arloing estimates that among the adult bovine animals five out of every one thousand are tuberculous. The proportion in England, according to Mr. Cope, is from 1 to 26 per cent., depending upon the locality. In Belgium the estimate is 4 per cent. In Holland the proportion given varies from 8.4 to 10.6 per thousand.

Dr. Winchester reported to the Massachusetts Cattle Commission that, during 1887 and 1888, he had learned of thirty-four head of cattle in which tuberculosis was actually demonstrated by post-mortem examinations. These herds contained 866 cattle. Of these, 243, or 28 per cent., were pronounced tuberculous, and upon being killed, were found to be diseased. In fifteen other herds there were 244 head. Twenty-eight of these showed marked symptoms of tuberculosis, and twenty-four more were suspected. Post-mortems, however, were not obtained. Thus in these forty-nine herds, consisting in all of 1,110 animals, 271 were reported as tuberculous and 213 as suspicious.

Later reports and more extensive examinations increase rather than diminish the per cent. of tuberculous animals.

Dr. Harold C. Ernst, in his report to the Massachusetts Society for the Promotion of Agriculture, published in 1895, in which he tabulates the replies given to a series of questions, gives the following summary:

In the practice of thirty-nine veterinarians, representing seventeen states, most of them reporting for one year only, there occurred 549 cases of tuberculosis, and 242 suspicious cases, a total of 749 among 165 herds, containing, in round numbers, 3,000 animals; that is, in the herds where tuberculosis existed, about 18 per cent. were diseased, and over 8 per cent. suspicious, a total of about 26 per cent.

It is proper to state here that, while tuberculosis is so prevalent and so widespread, the number of cattle affected with the other diseases named is comparatively small.

Having shown the extent to which tuberculosis exists, it is pertinent to inquire as to the danger of using milk from animals thus diseased. Nor is there an abundance of evidence wanting on this point.

Dr. Ernst, in obtaining data for his report above referred to, made an effort to obtain, so far as possible, clinical reports of cases of transmission of tuberculosis through milk from mother to offspring. In order to secure

reports from the most reliable as well as most probable sources of information, he addressed a letter to eighteen hundred physicians and veterinarians, selecting the former from the membership of the Massachusetts Medical Society of at least five years' standing, from the American Surgical Association, from the American Medical Association, and from one or two other special societies of the country. The names of the latter were taken from the rolls of the United States Veterinary Association, and included those who were thought to have had enough experience to to make their observations of possible value in this direction.

The direct question asked was: "Have you ever seen a case of tuberculosis which it seemed possible to you to trace to a milk supply as a cause?"

After receiving replies from the majority of those thus interrogated, he concludes his report as to the infectiousness of milk as follows:

"1. While the transmission of tuberculosis by milk is probably not the most important means by which the disease is propagated, it is something to be guarded against most carefully.

"2. The possibility of milk from tuberculous udders containing the infectious element is undeniable.

"3. With the evidence here presented, it is equally undeniable that milk from diseased cows, with no appreciable lesion of the udder, may, and not infrequently does, contain the bacillus of the disease.

"4. Therefore, all such milk should be condemned for food."

It is a well-settled fact that milk in the udder of a healthy cow is normal and free from all micro-organism, and that it is only after leaving the udder that these organisms make their appearance.

It has been an interesting question and the occasion of careful and painstaking observation and experimentation as to whether the milk, as it comes from the udder of a tuberculous or otherwise diseased cow, is so affected by her diseased condition as to produce the same or a similar disease in other animals (including the human) by using it; or whether the contraction of tuberculosis following the use of such milk is the result of the introduction of the tubercle bacillus during and after the process of milking.

The opportunities to determine this point must be rather few. As soon as the milk leaves the teat it is liable to infection in numerous ways, and even the calf receiving the milk directly into its mouth from the udder may get the infection from the external surface of the teat by germ-laden dust, or other adherent particles. Experiments that have been made in which all known or possible sources of infection were eliminated seem to prove conclusively that the milk of a tuberculous cow, even before it leaves the udder, as well as the meat of the animal, is infectious in character, unsafe, and unfit for food. This applies to cows in which there is no appreciable lesion of the udder, and is a refutation of the opinion so generally prevailing that only cows having tuberculous udders are capable of reproducing the bacillus in the milk.

At the Iowa Agricultural College experiment station, as a result of observations and experiments by Drs. Stalker and Niles, it was found that calves from healthy mothers that were at birth put with tuberculous animals to be raised, in a few months developed tuberculosis, while calves dropped from tuberculous animals and brought up by healthy cows showed no sign of the disease at all, grew well, were sleek, took on fat, and when killed later, showed none of the characteristic lesions of tuberculosis; thus showing that, so far as these experiments indicated, tuberculosis was not hereditary, and that the milk from tuberculous cows produced the disease in calves born of healthy animals.

Prof. James Law, in his very able paper on "Tuberculosis in Relation to Animal Industry and Public Health," dwells upon this point at considerable length. Coming from a source so eminent, his conclusions are entitled to, and have received, generous consideration and implicit confidence.

After considering the danger of the transmission of tuberculosis by the blood and meat of tuberculous animals, he proceeds to the consideration of the "danger from milk," and says:

"Milk is more to be dreaded than meat, because the udder is often the seat of tuberculosis, and the milk is usually taken uncooked. The danger is enhanced by the fact that this is often the necessary and only food of the infant and the invalid, in which the germ is especially liable, through weak and imperfect digestion, to escape into the susceptible bowel.

"In milk, as in the case of meat, a strong and vigorous digestion does, in some measure, protect the consumer. Peuch fed a two-months old pig in five days four and one half quarts of milk drawn from a tuberculous udder, and, killed in fifty-six days, it proved quite sound. He inoculated four rabbits with the milk and all four became tuberculous. Again, in the absence of tuberculosis in the udder the milk may be little, if at all, infecting. Gerlach, who produced tuberculosis in calves, pigs, and rabbits by feeding the milk, found no results from certain tuberculous cows, while others infected a large proportion. Nocard and McFadyean have been unable to infect rabbits, etc., with milk from an apparently sound udder of a tuberculous cow. The same has been my experience with milk from one cow in the last stages of chronic tuberculosis, and another having acute tuberculosis. Bollinger, Nocard, and McFadyean claim that in the absence of tubercle in the udder the milk is not infecting. Whether true or not, as an ultimate fact this cannot be made a rule of action, as the following will show:

"Hirschberger inoculated rabbits in the abdominal cavity with the milk of twenty-nine tuberculous cows, of which the udders were, or appeared, sound, and produced tuberculosis fourteen times.

"Bang inoculated from sixty-three cows selected for their sound udders, and found the milk of nine of them infecting. A careful microscopic examination revealed tuberculosis in the udders of three of the cows,

leaving six giving infecting milk in which even after death, and with all scientific appliances, no tubercle could be found in the udder. This is nine and one-tenth per cent., as tested by the microscope after death; it was fourteen and twenty-eight hundredths per cent., as tested by the able veterinary professor during the life of the cows.

"Ernst found ten cows in thirty-five with infecting milk, though the udders were sound. In one hundred and three animals inoculated, seventeen contracted tuberculosis, and of twelve calves sucking the cows, five became tuberculous.

"Drs. Smith and Kilborne (Bureau of Animal Industry, Bulletin No. 3), found the milk infecting in three cows out of six with apparently sound udders. One infecting cow, and one non-infecting one, had each tubercle in the lymphatic gland behind the udder. Forty-four per cent. of the inoculated guinea pigs contracted tuberculosis; one in five from one cow, eight in ten from another, and six in six from a third.

"In my own experience, three calves from healthy parents sucking the apparently sound udders of three cows with general tuberculosis, all contracted the disease.

"It must be allowed that calves sucking the cows run extra risk of infection through their nurses licking them, and through feeding from a common trough, but there is the same danger for the ordinary milk consumer, since the cow in licking her udder, is liable to leave bacilli to fall into the pail at the next milking.

"Again, the concentration of the bacillus in the undiluted milk of an infecting cow, rendered this much more dangerous than the milk of the same cow diluted with that of twenty, fifty, or one hundred cows.

"Bollinger and Gebhardt found that milk which infected all animals which took it pure, was apparently harmless when diluted with fifty or one hundred times its volume of the milk of sound cows. As the bacillus can live in milk, this apparent loss of virulence must be largely due to the reduction of the number of bacilli in a given measure of milk, and to their tendency to removal by adhering to the sides of the vessel during the mixing.

"Tuberculous expectoration, which is incomparably richer in bacilli, may be diluted in one thousand times its volume of water, and yet remain infecting. But again, the glutinous saliva forms a protecting coating which strongly resists dilution.

"Instances of accidental tuberculosis of the human being through drinking the unsterilized milk are no longer wanting.

"In the practice of Dr. Amorback, a well-developed five-year-old boy from sound parents, whose ancestors on both male and female sides were free from hereditary taint, succumbed after a few weeks' illness with acute milliary tuberculosis of the lungs and enormously enlarged mesenteric glands. A short time before, the parents had their family cow killed, and found her the victim of advanced pulmonary tuberculosis. (Lydtin).

"Dr. Demme records the case of four infants in the Child's Hospital, at Berne, the issue of sound parents, without any tuberculous ancestry, that died of intestinal and mesenteric tuberculosis, as the result of feeding on the unsterilized milk of tuberculous cows. These were the only cases in which he was able to exclude the possibility of other causes for the disease, but in these he was satisfied that the milk alone was to blame.

"After a lecture of the author's at Providence, R. I., a gentleman of North Hadley, Mass., a graduate of the Massachusetts Agricultural college, publicly stated that his only child, a strong, vigorous boy of one and one-half years, went to an uncle's for one week and drank the milk of a cow which was shortly after condemned and killed in a state of generalized tuberculosis. In six weeks the child was noticeably falling off, and in three months he died, a mere skeleton, with tuberculosis of the abdomen. The father could trace no tuberculosis among his near ancestors, but the mother's father and uncle had both died of it. She remains in excellent health.

"Dr. E. O. Shakespeare (*Med. News*, March 26, 1892) attributes one fifth of all deaths of infants and young children feeding on milk to tuberculosis, usually commencing in some part of the digestive organs."

In June, 1896, Drs. Sidney Martin and Gins Woodhead, and Professor McFadyean, of the Royal Commission of England, who were appointed to make special inquiries as to the effect of food derived from tuberculous animals, made their report. The report of Dr. Martin, who is exceedingly conservative, is of special value, because of the positive results he obtained with regard to the infectivity of milk from tuberculous cows. He says: "The milk from cows with tuberculosis of the udder possesses a virulence which can only be described as extraordinary."

He recommends as a practical measure, that the milk from all cows in which one or more quarters of the udder are enlarged, or modulated, or in which the milk from one or more quarters fails either in quality or quantity, should be at once excluded, and the cows examined by an expert. He further declares that every tuberculous cow must be looked upon with suspicion, for, although the presence of tuberculosis of the internal organs, in his opinion, does not confer infectivity on the milk, yet tuberculosis may develop in the udder at any stage of the general disease.

Dr. Woodhead, by his experiments and observations, arrives at the conclusion that in children, at least, general tuberculosis infection is, in many, very many cases to be traced to the ingestion of infected milk—that is, it is not necessary that a local lesion of the alimentary canal should be produced. The tubercle bacillus may run the gauntlet of the lymphoid tissue of the intestines and pharynx, to establish itself in the mesenteric, or the cervical, and finally the trachio-bronchial glands, from which, by a process of extension, or secondary infection, tuberculosis of the peritoneum, the lungs, or a generalized tuberculosis may ensue.

Prof. M. Stalker, of the veterinary department of Iowa Agricultural College, who has been making extensive investigations of this subject, reports two cases which came under his observation. One case was where five young people between the ages of twenty and thirty years died of consumption in one family during a period of two years. No trace of the disease had ever been known in the family of either the father or mother of the victims. On the farm where the deaths occurred, he found seventeen cases of tuberculosis in the herd of cattle, and others had died before the investigation was made.

Another case was in connection with a diseased herd of cows that was under test. A mother and child died; the mother from undoubted consumption; the child from intestinal trouble highly suggestive of the same disease. The cow that had supplied milk to the mother and child was tested and found to be tuberculous. Post-mortem examination of the cow revealed a badly tuberculous condition of the udder.

Enough has already been said to convince the most skeptical that there is great danger of infection from the use of milk from diseased animals, especially from tuberculosis.

Unfortunately, the only infected and dangerous milk is not from tuberculous cows. It is well known that the best milk—milk from cows in which there is not a taint of disease, after leaving the cow becomes infected. It will be readily conceded that the most of the cases of disease arising from the use of infected milk occur where the milk has been from healthy cows, and into which the pathogenic germs were introduced after leaving the cow. The extensive epidemics of infectious diseases produced by the use of infected milk arise in this manner.

Drs. Busey and Kober, above referred to, in noticing some instances of milk that had acquired infective properties only after it had left the udder of the cow, say:

"Numerous instances have been observed in which outbreaks of typhoid fever, scarlet fever, and diphtheria, by their sudden and explosive character, affecting families living in streets or localities visited by the same milkman, naturally pointed to the milk supply as a common cause; but to Dr. Michael Taylor belongs the honor of being the first to point out definitely that cows' milk might serve as a medium of spreading typhoid fever from a dairy where the disease prevailed. In 1867, Dr. Taylor also showed that scarlet fever might be distributed in the same way. In 1877, Mr. Jacob traced a diphtheria epidemic at Sutton to milk supply, and in 1872, Macnamera traced an epidemic of cholera at Calcutta to an infected dairy."

These facts could not fail to invite criticism and sharpen the power of observation in others, and in consequence similar outbreaks were more frequently reported, so that Mr. Ernst Hart, in a most valuable paper, was enabled to present to the International Medical Congress held in London, 1881, the history of fifty outbreaks of typhoid fever, fifteen of

scarlet fever, and seven of diphtheria, all traceable to the milk supply; but even this formidable display of facts was not accepted as conclusive, largely because the milk industry constitutes a strong spoke in the commercial wheel, and naturally opposed what they considered meddlesome interference with their trade, and in many instances were upheld by members of our profession who considered the evidence wholly circumstantial and incomplete, as long as the specific germ of the respective diseases had not been demonstrated in the suspected milk. * * * An approach in this direction worthy of emulation has been made by Prof. Vaughan before the Congress of Demography, in London, August, 1891, when he declared:

"Milk has been frequently diluted with water containing germs of typhoid fever, and the prevalence of the disease may mark the daily rounds of the milkman. I have here a culture tube containing a bacillus which I found simultaneously in the water from the dairy well, and in the milk from the cans. At the same time one or more cases of typhoid fever existed in every family which patronized this milkman. The bacillus resembles, but is not identical with, that of Eberth."

They further, in their report of epidemics of typhoid fever, scarlet fever, and diphtheria, say:

"Mr. E. Hart tabulated fifty epidemics of typhoid fever, and we have collected eighty-eight, making a total of one hundred and thirty-eight epidemics traceable to a specific pollution of the milk, the main facts of which are presented in a subjoined table. In one hundred and nine instances there is evidence of the disease having prevailed at a farm or dairy. In fifty-four epidemics the poison reached the milk by soakage of the germs into the well water with which the utensils were washed, and in fourteen of these instances the intentional dilution with polluted water is admitted. In six instances the infection is attributed to the cows drinking or wading in sewage-polluted water. In three instances the infection was spread in ice cream prepared in infected premises. In twenty-one instances the dairy employés also acted as nurses. In six instances the patients while suffering from a mild attack of enteric fever, or during the first week or ten days of their illness, continued at work, and those of us who are familiar with the personal habits of the average dairy boy will have no difficulty in surmising the manner of direct digital infection. In one instance the milk tins were washed with the same dishcloth used among fever patients. In this instance the disease was attributed to an abscess of the udder (?), in another to teat eruption (?), and in still another to a febrile disorder (?) in the cows. In four instances the disease was spread through the medium of creameries, and in one instance the milk had been kept in the sick-room.

"Mr. Hart collected statistics of fifteen epidemics of milk scarlet fever, and we have tabulated fifty-nine, making a total of seventy-four epidemics spread through the medium of milk supply (?).

"In forty-one instances the disease prevailed either at the milk farm or dairy. In six instances persons connected with the dairy either lodged in or had visited infected houses. In another instance the milkman had taken his can into an infected house. In twenty instances the infection was attributed to disease among the milch cows; in four of these the puerperal condition of the animal is blamed. In nine instances disease of the udder or teats was found. In one instance the veterinarian diagnosed a case of bovine tuberculosis. In six instances there was loss of hair and casting of the skin on the animals. In another instance the cattle were found to be suffering more or less from febrile disturbance. In ten instances the infection was conveyed to persons connected with the milk business while suffering or recovering from an attack of the disease, and in at least eight cases by persons who acted as nurses. In three instances the milk had been kept in the cottage close to the sick-room. In another instance the cows were milked into an open tin can, which was carried across an open yard past an infected house; and in another instance, the milkman had wiped his cans with white flannel cloths (presumably infected) which had been left in his barn by a peddler. Two epidemics appear to have been instances of mixed infection of scarlet fever and diphtheria.

"He also collected statistics of seven epidemics of milk diphtheria, and we have added twenty-one more. In ten of these twenty-eight instances, diphtheria existed at the farm or dairy, and in ten instances the disease is attributed directly to the cows having garget, chapped and ulcerative affections of the teats and udder, while in one instance the cows were apparently healthy, but the calves had diarrhœa. In another instance one of the dairy-maids suffered from a sore throat of an erysipelatous character; in another, the patient continued to milk while suffering from diphtheria; and in still another, one of the drivers of the dairy wagons was suffering from a sore throat.

"It is interesting to note that of one hundred and thirty-eight epidemics of milk typhoid, seventy-four of scarlet fever, and twenty-eight of diphtheria, a total of two hundred and forty epidemics, one hundred and eighty-seven have been recorded by English authors, thirty-one by American, and nine by Scandinavian; eight came from Germany, three from Australia, and one each from French and Swiss sources.

"Whether this is due to the fact that on the continent of Europe milk is rarely used in a raw state, or whether it is simply an index of the greater interest taken in England and the United States in preventive medicine, remains to be determined."

Three or four instances of epidemics of typhoid fever occurring in this country from the use of infected milk will be given somewhat in detail, in order, not only to demonstrate that such outbreaks do occur, but to also illustrate the necessity for, and the success attainable by, intelligent and faithful investigation.

In June, 1890, the Connecticut State Board of Health was requested to investigate an outbreak of typhoid fever at Waterbury. Attention was first directed to the water supply and drainage, which were found were not to be the cause. There were thirty-five house invasions with fifty cases. Of these, twenty-six houses, with forty-one cases, it was discovered, were supplied with milk from the same milkman; that this milkman secured his milk from several farms; that the invasion followed the route of milk from a certain one of these farms. An investigation was made at this farm, and it was found that the farmer, his daughter, and a farm hand had been sick with typhoid fever. The excreta of the sick were thrown upon the barn-yard; the hired man defecated, so long as able to be about, in the cow stables. The barn-yard was in a bad condition. The milk was handled in a shed attached to the barn. In fair weather the milk cans were washed outside the shed; on rainy days inside the shed. A door opened from the shed into the cow stables on one side, and another door into the barn-yard. In the yard was a tank in which the milk cans were placed to cool. The can lids were tilted so as to admit the air. There could be no question as to the source of the infection of the milk. The water used was from a spring, and free from the typhoid bacillus. The material of the barn-yard was infected, and the conditions were favorable for extensive multiplication. It was tracked into the milk room by the men, and there drying into dust, was carried by air currents into the milk.

Among the cases in this invasion, was one of a person who did not use the milk. But it was found that two weeks prior, ice cream had been eaten, and that the milk came from the infected farm—thus confirming the work of Prudden, and others, that typhoid bacilli retain their vitality for months frozen in blocks of ice. The milk supply from this farm was stopped, and the disease subsided.

In August, 1892, an epidemic of typhoid fever appeared in a particular portion of the city of Springfield, Mass., a detailed account of which is given in the report of the State Board of Health. The people, as well as the physicians, were perplexed, and various theories were put forth as to the source of infection; for it was in the best part of the city, where the environments apparently precluded the usually accepted sources. First, the water of certain wells was suspected, but investigation showed that most of the infected families used only water from the city waterworks, which was uncontaminated. The drainage was suspected, but it was shown that the houses were mostly new, and the plumbing good. The sewer was suspected, but families living nearest the manholes of the sewers were unaffected. The cemetery was also suspected, but it was found that a well in the cemetery contained less ammonia than wells in the typhoid district, where the disease was most prevelant. The theory of ice infection was also tested and exploded. It was finally discovered that all the infected families were supplied with milk from one man; that

in the most infected portion, one family was exempt entirely from the disease, and this family received milk from another milkman. On investigation of the farm of the milkman, it was found that early in the spring the milkman's daughter was sick with so-called "bilious typhoid fever." Others of the family were also sick with a "slow fever." The excreta of the patients were thrown into a privy vault, and the contents of the vault were subsequently thrown upon a tobacco field. Near by was a well not used for drinking purposes. Into this well the milkman lowered his cans of milk, letting them sink to the bottom, to remain until they were taken away to supply his route. In the well was an old chain pump. Over the well were loose planks. The men, in wet weather, tramped over the tobacco field, through the cow yards, and then to the well. The planks over the well were filthy with mud, and careless pumping washed the mud and filth into it. The water was dirty, and was found to contain *bacilli coli communis* to an enormous extent. Nine milk cans were lifted from the well. They were stopped with wooden stoppers. On tipping the cans, milk ran out around the stoppers. This being true, the water of the well would run in. None of the cans were full. The facts, as developed in this investigation, left no room for doubt or question as to the source of the epidemic, wherein there were one hundred and fifty cases, with twenty-five deaths. Of the one hundred and fifty cases, one hundred and one had milk from the same man, and one hundred and thirty-five had access to the same milk.

In October, 1894, the secretary of the Board of Health of Titusville, Pa., found three cases of typhoid fever on a farm. From this farm milk was taken to the city. Within four weeks there were fifty cases of typhoid fever, all in families which had been using milk from this farm. The first case on the dairy farm was brought from this city, Buffalo. The mother took care of the sick and the milk at the same time.

In April, 1895, a serious outbreak of typhoid fever occurred in the city of Stamford, Conn. It was so sudden and widespread that Dr. Lindsley, secretary of the State Board of Health, was called to make an investigation as to the cause, and to assist in suppressing it. He reports that attention was first given to the water supply, but was soon abandoned. So, also, the food supply. It was soon discovered that sickness followed exactly the route of a certain milkman. In various parts of the city, there were three hundred and eighty-six cases, of which three hundred and seventy-six were persons who used milk from this milkman, while in houses contiguous, where milk from another source was used, there were no cases. There were twenty-five deaths. The appearance of the disease was simultaneous over the district. So soon as the source of infection was discovered, the milk supply from this man was stopped, and the disease at once subsided. Investigation of the premises of the milkman revealed the fact that he washed his milk cans with water from a well which chemically showed contamination by sewage. Prud-

den discovered six thousand, six hundred and ninety living bacteria in a single cubic centimeter of the water.

The water in the well was only one foot and nine inches below the surface, and overflowed in the spring, and surface drainage was toward the well. A shallow privy vault, leaking at the surface, was twenty-five feet distant, and free of access to a "walking case" of typhoid fever. The conclusion was irresistible that the source of this outbreak was milk, and the source of infection of the milk was the water from this well, contaminated by drainage from this privy.

The foregoing is sufficient to establish the fact that milk from infectious animals, especially from tuberculous animals, and that also from healthy animals when infected by disease germs, is dangerous and leads to a very brief consideration of the sources of infection and the remedy.

It is not necessary, as it would not be profitable, were it possible, to note in detail all the physiological or pathological processes by which the milk of a tuberculous cow is changed in the udder from a healthful and nutritious product into one carrying disease and death to those who use it. We only know that such has been demonstrated to be the fact.

I have pointed out in the instances above given, some of the methods by which milk, after it leaves the udder, becomes infectious. While milk in the healthy cow's udder is free from bacteria, it is well known that the milk of commerce, especially as found in the cities, is swarming with these micro-organisms. Fortunately, few of these bacteria are harmful, and many are useful, if not essential.

While, therefore, milk is favorable to the growth and development of so many harmless germs, it is also favorable for the propagation of pathogenic germs.

The following are some of the methods by which these germs, beneficent and malevolent, gain access to the milk outside of the udder:

By the process of milking itself. Particles of dirt from the hands of the milker, from the teats and udder, and from the sides of the cow, fall into the pail. The pail itself may have been washed with impure water, and been imperfectly dried; or the germs may have been floating in the air and settled in the bucket before, during, or after the milking. The stables may have been in a filthy condition, and the cows lying in the filth, having it adherent to their udders, drop it into the pail. The hands of the milker are often moistened with the milk to contribute greater ease and facility to the process of milking, and drops of the milk thus used, laden with impurities, if not with filth, get into the milk.

Then, it often happens in many ways, that the milk after it leaves the dairy is infected by the addition of water, and by varying changes of temperature, especially a higher temperature, which greatly favors the rapid multiplication of the bacteriæ.

Even if the milk has reached the consumer in good condition, it may become infected because of the filthy or careless habits of the inmates, or

by the presence of infectious diseases in the family. It has been found in several instances that milk was infected in the dairy because of sickness in the home of the proprietor or some of the milkmen.

Is it any wonder, then, that milk should be rendered infectious? Is it not rather a miracle that the mortality from its use is not greatly multiplied? The only remedy is suggested by the causes above enumerated, and may be summed up under three heads—inspection, cleanliness, and sterilization.

All dairy cattle should be carefully inspected by a competent veterinarian, with a view to determining the presence of tuberculosis, and all diseased or suspected animals should be condemned. The habits of dairymen with respect to cleanliness, the barns, the water supply, should all be known and recorded.

The sale of milk from dairies or private families where infectious diseases exist should be prohibited.

The strictest cleanliness of animals, persons, and surroundings should be enjoined and enforced; and the almost certainty of infection from the lack of cleanliness, as well as the terrible results so often following the use of milk so infected, should be taught in every home and school.

But with all this teaching, and the most rigid inspection, there will be vast quantities of dangerous milk sold and used, and sickness and death ensue in consequence, unless those receiving the milk resort to sterilization.

To "sterilize" milk the temperature should be raised to the boiling point, and kept there for a few minutes. It has been suggested that a few spores will, at this temperature, perhaps not be destroyed, and their presence will sooner or later cause the milk to sour, hence the milk should be subjected to two hundred and twenty degrees heat.

Both Pasteurization, and the raising of the temperature to two hundred and twenty degrees, require the use of a thermometer—an instrument that is kept in comparatively few homes, and when kept is far from being reliable. Hence I recommend as the best, because the simplest and most reliable method, the boiling of the milk. The best way is to place the milk in bottles tightly corked and boil them while immersed in water. The bottles should only be filled within about two inches from the cork, so as to allow for the expansion of the milk. After boiling, the bottles should be left in the water until it is cool, as their removal while hot will break the bottles. With this simple process that can be practised in any home and by anybody who can tell when water is boiling, there will be practically, if not absolutely, no danger from disease germs, and milk may be kept for some days, especially in a cool place, without becoming sour, or altered in any way.

Milk in larger quantities may be sterilized by being placed in tightly covered pails, or cans, and boiled in a kettle or boiler containing water.

Professor Jacobi, of New York, one of the highest authorities we have

on infant feeding, etc., says: "Virtually sterilization" (by boiling) "has been practised by me more than forty years, and has been taught by me these thirty-five years, both in lectures and in books and essays. I have always urged that safety increased with the number of boilings."

There are many expensive and ingenious contrivances for sterilizing milk, but I believe that the above simple methods are not only practical and economical, but reliable.

DISCUSSION ON THE REPORT OF THE COMMITTEE ON ANIMAL DISEASES AND ANIMAL FOOD, AND THE PAPER OF DR. KENNEDY ON MILK.

DR. GARDNER T. SWARTS.—As I have been unable to prepare a paper on the subject of pure milk, since hearing the excellent contribution of Dr. Kennedy I am glad I have not written it, for a good many of the details have been brought out by him. One reason for not presenting a paper was this, that I was coming into a community where pure milk was one of the fads. I believe Iowa and Indiana have laws regarding this subject. The manner in which I wish to approach this question is not by considering solids and fats alone, but the question of cleanliness entirely. By obtaining cleanliness the other results will follow. Much excellent work has been done along this line by Dr. Freeman of New York. He has found that the contamination of milk occurs not so much from the air of the barn and the utensils used as from the hide and udder itself during the process of milking. He has endeavored to obviate this somewhat by insisting that the hands of the milkers be washed at frequent intervals. This was done, but the result was not as beneficial as was at first expected. Knowing the channels through which contamination takes place, we know that uncleanliness is the principal factor to which attention should be directed, and endeavors made to correct it.

As has been stated in the paper, tubercle bacilli enter the milk, and tubercular meningitis and tubercular enteritis in infants, which are altogether too common, cannot be explained on the ground of heredity or locality in which patients may live, but they can be explained by the ingestion of tuberculous milk. That such a high mortality is allowed to continue in some localities is a shame. It can be obviated by the eradication of tuberculosis in herds of animals, as the disease appears.

In sending out a circular letter to the physicians in Rhode Island, inquiring as to how many knew where their own supply of milk came from, at least 50 per cent. of them did not know, yet they were willing to recommend this milk to their patients and drank it themselves; in other words, they were recommending something which was deleterious to the people. This matter should not be left entirely to health officers or physicians, but every one who is connected with sanitary matters should take an interest in it.

As to the reform which should be brought about, we all admit that

tuberculosis is sometimes produced by drinking infected milk, but more frequently is enteritis in children brought about by taking dirty or impure milk, which is not cooked as other foods are. We admit that all of these conditions confront us, but how are we going to obviate them? We must place before the public a milk which is free from tuberculosis and contamination from uncleanliness, and there are places in this country where this has been carried out. At one farm in Buffalo the purity of the milk is certified to. In Orange County, N. J., an attempt was made to purchase clean milk, and the method adopted was by several physicians guaranteeing to the purity of the milk from a certain farm, the milk being produced under bond that all agreements should be carried out, the herds being examined and pronounced free from tuberculosis by the tuberculin test, or from disease of any kind. In this case the hands of the milker are washed before milking. The milk is allowed to drop into pails previously sterilized, so that no water can contaminate the milk. These pails are of the usual pattern, but covered over the top, with an opening about six inches in diameter covered with an immovable fine mesh sieve. As the milk comes from the udder it is cooled at once to a temperature of 45°, then placed in bottles, previously washed and sterilized, capped with sterilized paste-board, and kept at the temperature mentioned until it is delivered to the customer. You can readily see that by this means we have a minimum contamination, for if any organisms are present we have a minimum of their production, and if the milk is given to the customer at that temperature it will be used before any of it can decompose and be rendered impure by the formation of ptomaines. This plan can be carried out in every state or city if the health officers will take a sufficient interest in the matter. I have started two farms on this basis in Rhode Island, but sufficient time has not elapsed for me to give reliable data. Of course, it necessitates the raising of the price of milk, but the question arises whether the consumer prefers dirty milk at four cents, or certified milk at eight cents. We should disseminate our knowledge of this matter among the people the same as we do of other things which pertain to the public health.

In regard to the sterilization and boiling of milk. The boiling of milk, as most of us know, renders it different from what it was before. It is not assimilated by the child as readily. Furthermore, it has been shown that sterilized milk, which some infants are fed upon continuously, causes scorbutus and other degenerative diseases.

Dr. P. H. Bailhache.—I heartily approve of Dr. Swarts's idea of requiring an examination and inspection of dairies from which milk is obtained. I also approve of obtaining milk in the manner suggested by him, but I would like to inquire whether he or any one considers it practicable to obtain milk for a hospital or a hotel in the manner suggested, where 150 gallons of milk are consumed daily. It seems to me, it is impracticable. I have been in the habit of requiring all cans of milk for the

hospital to come wired and sealed from the dairy, and not opened until they arrive at the hospital. That is the method I resort to.

DR. BENJAMIN LEE.—I wish that the closing sentence of Dr. Swarts's remarks had been more emphasized and expanded. I do not believe that in the sterilization of milk we have at all arrived at the ultimatum for the proper treatment of milk as a food for infants. I am most thoroughly convinced that since the introduction of the sterilization of milk we have had introduced among us two diseases which up to that time were scarcely recognized. I know that when I studied medicine, I knew nothing and heard nothing about infantile scurvy, and scarcely anything about rickets. Rickets, we were taught, was a disease existing among the poor and ill-fed inhabitants of European cities. In this country it was very rarely seen. I venture to say, that there are few physicians practising now in our large cities who do not quite frequently see cases of infantile scurvy and of rickets. I cannot but connect these two facts together—the sterilization of milk, and the production of these two diseases. I believe in some way the destruction of the lactic acid germ interferes with the assimilation of the phosphatic salts in the milk, which are known to be one of the essential elements of nutrition of the infant.

Unquestionably, we cannot insist too much on cleanliness in milk for infants, and all recent efforts in this direction are to be greatly commended. But I insist, that, if it is possible to procure a pure, fresh milk, from a healthy cow, it is better to give it to the infant unsterilized. I believe also with the gentleman who preceded Dr. Swarts, that if we are going to cook the milk, we had better cook it thoroughly than half cook it. I believe that boiled milk is safer than sterilized milk.

DR. JAMES F. HIBBERD.—I do not rise to discuss the papers which have been presented in a general way, further than to say that I think both of them are well calculated to direct the attention of the people of the country to the necessity, in the first place, of healthy food of all kinds, and particularly of pure milk. In the last paper, it seems to me, we have a forcible presentation of the things that we ought to know and concerning which the public depend upon us for information. If I am right in my apprehension of what is calculated to take us off of exact observation of scientific processes, I think we ought to have a substratum of perfect knowledge. A very excellent man three or four years ago, a lawyer by profession, a statesman by practice, announced that he thought the time of supremacy of doctors was just coming, because of our exact methods of ascertaining truth. If we are entitled to that credit, we must keep it up by maintaining the establishment of absolute truth. If we do not get at the absolute truth, we should acknowledge that we are not yet really perfect. The point I would make is this, that in the artificial feeding of children, it is said that 70 per cent., or perhaps 700 out of 1,000 of the deaths, are due to the bad character of the nursing, that is, to the bad milk. This point was made in one of the papers. How is it established?

Do we know it? Is it not a surmise, after all? Suppose 700 children were fed by artificial methods and died, must we attribute their deaths solely to the method of feeding? Was there nothing else, such as environment, etc., that contributed to the cause of death? If I am right in this, what we have heard to-day is not calculated to do harm to the public, yet it puts a little cloud upon our perfect knowledge. I apprehend the children artificially nursed or fed, all of them, have an environment and things around them which materially contribute to their bad health, and which in many cases cause death.

One other point in regard to tuberculosis being transmitted through milk. Three or four years ago I wrote an article on the subject and took the ground that tuberculous milk would actually infect children who were nursed on it. There is no doubt of there being tubercle bacilli in milk. There is no doubt if these tubercle bacilli can get through the milk into certain tissues of the body of children or adults it will contaminate them. Has it ever actually been established that a child, known to be healthy and taking tuberculous milk, will carry the germs of the disease through the digestive organs, implant them in the system, and thus impregnate it with tuberculosis? I have made inquiries of several physicians regarding this matter, and I could not get a positive answer from any one of them. One gentleman, a noted writer, said it was so from absolute experiments, which were undeniably truthful in their character, but he failed to furnish me proper reference. I would like to know absolutely whether the tubercle bacilli will pass the digestive organs of a healthy child and contaminate its system elsewhere.

A third point in my mind was with regard to sterilized milk. Has it not been charged during the present calendar year that children starved to death on sterilized milk?

Dr. J. B. Learned.—I would like to present a phase of the question which I do not think has been touched upon by any of the preceding speakers, namely, that the child's condition when taking food into the stomach, which food always contains more or less poisonous germs, whether it be meat or milk, is, it seems to me, the measure of the child's or individual's security. In other words, it is entirely possible for us to be exposed to what we call "colds" and not take cold. It is entirely possible for a child in some instances whose health is above par to live in a family where tuberculosis, scarlatina, and other diseases of children exist, that are communicable, and yet that child will escape being attacked by any of these diseases. A high standard of health will best prepare a child to resist the invasion of tuberculosis and other diseases. I believe that if we were to study the wants of our children in this direction, providing them with pure air, proper food, taken at proper times, proper clothing, a sufficient amount of sleep and exercise to restore them from their ill inheritance, and degeneracy, a higher standard of health would obtain; and that it would be much better for us to direct our efforts

along this line than to attempt to annihilate tubercle bacilli which are almost everywhere present.

Dr. E. H. Carter, of Des Moines, Ia.—It is my opinion that there is nothing a child takes in the way of food that is half as filthy as milk. I have made investigations in this direction, and I am of the opinion that we cannot do too much towards bringing about a reformation in dairy milk. The dairies are filthy, the cows are filthy, they are kept in bad condition and bad places, and the men who do the milking are exceedingly dirty. The men themselves, who do the milking, are sometimes diseased. Some law ought to be established, and an inspector appointed to visit all the dairies and see that the cows are washed and brushed, and the man's hands who does the milking are washed and clean. I employed a man some time ago to work for me, and among his duties he was to milk the family cow. He said he knew all about the work in connection with dairies, and had been doing this work for two years. During his experience of two years in milking, he never washed his hands before doing so; neither did he wash the udder of the cow, and said he never saw one washed. A second man told me the same story. I told him that if he worked for me he would have to wash his hands, as well as the cow, so that nothing would fall in the milk bucket. I watched him carefully for two days, but he would not fulfil the contract. It is time that something should be done in this matter. Scarcely anything can be cooked without milk. Milk enters into everything. It may be that heat destroys all filth. It may be possible. If anything can be done to purify milk, our efforts should be directed towards doing so.

With reference to muzzling dogs, I think a shotgun is much better for a dog than a muzzle.

Dr. Henry D. Holton.—While we have tuberculosis in Vermont among the cattle and among the dairies, the question has arisen whether or not any human being has been infected by the use of the milk. I agree very much with what Dr. Hibberd has said. Two or three years ago I tried to find some authenticated cases in which tuberculosis had been communicated by the use of the milk of the bovine race. I was not able to find a well-authenticated case. The fact that some children had had tuberculosis, and had used milk from a tuberculous cow, was all the evidence that I could get. Perhaps that was enough, but it was not sufficient for me. I believe in having herds inspected; I believe in municipal regulation, and no milk should be sold unless the herds supplying such milk are subjected to a thorough test, and are known to be free from the disease. It is not everybody who takes in tuberculous germs that will develop tuberculosis. I do not inherit that sort of mucous membrane. I came from a race that never had tuberculosis. It seems to me that heredity has more to do with this matter than is just now conceded. There must be a peculiar condition of the mucous membrane, in order that the bacilli may find the proper lodgment. If one does not inherit

such a mucous membrane, or has not acquired it, the secretions of the *prima via* will destroy them. For several years it has been my habit to drink a tumbler of milk at night before going to bed. The supply of milk came from the herd of a patient of mine, who desired to give me the best milk possible. Consequently, he sent me the milk from what he considered his best cow. Reading on the subject of infected herds, he had his herd tested; my favorite cow was found not only to have tuberculosis in a more advanced stage than the rest of the herd, but more generally disseminated through her system. Her milk was not examined; —now I escaped infection either because there was no bacilli in her milk, or because of the healthy condition of the mucous membrane of my alimentary canal. The reason why I speak of this is because I think we are alarming the public altogether too much. The report goes out that we say that if a person drinks the milk of a tuberculous cow, he will have consumption and die. I find sometimes mothers who object to feeding their children on milk. They want to feed them on patent foods. God knew what he was about when he made milk for them. I would have every herd inspected before the milk is sold, but I would not have it go out before the public that we must not drink milk for fear that it is impure, and that we are going to get, through drinking it, tuberculosis, and various other ills. I do not believe tuberculosis has increased among herds of cattle in this country. It was just as prevalent twenty-five or thirty years ago as it is now. The disease was not recognized as readily then as it is now. I must enter my protest against the alarm which may be conveyed to the public with reference to the drinking of tuberculous milk.

Dr. J. J. Kinyoun.—I do not think that the remarks of Drs. Hibberd and Holton should be passed over without comment. They do not believe that there are any authenticated cases where tuberculous animals have transmitted the disease to the human subject. I refer them to the report of the British commission, in which instances are given where the disease tuberculosis has been transmitted to children through infected milk. The reports of the Bureau of Animal Industry also show that tuberculous animals can transmit the disease to other animals. If the gentlemen would read these reports, they would form different conclusions.

Dr. Gardner T. Swarts.—In answer to the question of Dr. Bailhache, the farm I spoke of supplies 2,200 quarts of milk daily, and if it is possible for one farm to do this, fifty can do it. The milk is placed in glass bottles or jars holding one quart each. Any hospital or institution having the care of invalids, that does not attempt to supply its inmates with pure milk, is culpable in a high degree.

Dr. D. E. Salmon.—I would like to say a few words in closing this discussion, and first with reference to the question as to whether it has been proved that the tubercle bacillus taken into the stomach of a healthy child will infect that child. There can always be objections raised to conclusions drawn from any observations that are made upon such a sub-

ject. When, however, we consider the fact that tuberculosis may be caused in animals, such as swine and calves, by feeding them on milk from tuberculous cattle; when we consider, also, that children often die from tuberculosis, and lesions of the disease are found post-mortem where we would expect to find them if the tubercle bacilli had penetrated the intestinal walls, we must necessarily conclude that the disease may occur in children, as it does in animals, from the tubercle bacillus being taken into the stomach with the food. I see no way of escaping that conclusion.

Again, as to the method of prevention by raising the standard of health among the people, rather than by fighting the tuberculous germ where we find it. Any physician here, if he goes over his experience, must conclude that it is not those people who are in the poorest health who always succumb first to tuberculosis, or who are most apt to be afflicted with the disease. I can remember, in my own experience, some of the strongest and most robust young men of my acquaintance who contracted tuberculosis and died from it, while I escaped, although I have never had such robust health as they. If we consider our experience with other contagious diseases, we shall find the same to be true with almost all of them. It is not always the strongest and healthiest person that escapes. Very often it is the opposite. Immunity from contagious diseases does not depend entirely upon the strength of the individual or upon his health, but it depends upon other conditions which we do not as yet fully understand, owing to the difficult nature of the investigations which are necessary to reveal them.

As to the alarming reports in regard to tuberculosis among cows, and the relative prevalence now and during periods of one-quarter of a century ago, we had no means of knowing the proportion of cows affected with tuberculosis at that time. We could not tell now were it not for the tuberculin test. Even post-mortem examinations, which were made and recorded before the tuberculin test was used, are now considered worthless, because they were not made with sufficient care. We know, to-day, that cases may give a reaction to tuberculin, and if we make the ordinary post-mortem examination, such as was common a few years ago, we should not find tuberculosis. If we examine all the lymphatic glands; if we examine carefully all the structures of the body, we find in almost every instance lesions of the disease, in all of the cows, which react to the tuberculin test. The tuberculin test forces us to make more careful post-mortem examinations, so that I say the conclusions as to the prevalence of tuberculosis a quarter of a century ago are absolutely worthless, because we have no data to form an opinion. The fact that tuberculosis is a contagious disease, and when introduced into herds of cows spreads rapidly, is sufficient reason to believe that the affection is on the increase. With the great traffic in cows, in thoroughbred cattle, with the facilities for transporting them to all parts of the country, and with the speculative trade in this class of ani-

mals, the disease is carried from one part of the country to another. We find in breeds of cattle like Jerseys the largest percentage of cases of tuberculosis to-day, and we can explain it upon no other grounds than that. I have no doubt in my mind, that, if this unrestricted traffic goes on and measures are not adopted for preventing the disease, at least 50 per cent. of them will become infected, as they have on the continent of Europe and Great Britain. In some herds, in this country, of one hundred or more animals, at least 70 per cent. of them have been found infected with tuberculosis. In the face of that fact, and in face of the fact that in Europe they have in large districts from 50 to 60 per cent. of the cows infected with tuberculosis, we cannot be quiet as to the dangers of contracting tuberculosis through milk. It is necessary to educate the people regarding these facts, and particularly as to the dangers to which they are exposed by drinking impure milk; otherwise our boards of health will not be sustained in the efforts necessary to prevent the disease.

In regard to the statement that Dr. Holton drank tuberculous milk without being infected, I do not think he is absolutely sure that the milk contained the bacilli of tuberculosis. The milk is not infected unless there are tubercles in the udder, or unless the disease is very far advanced. It seems to me that he has no data by which he can state positively that there were tubercle bacilli in the milk which was consumed by him. The milk of a large tuberculous herd is much more dangerous than the milk of any individual cow, because we are almost sure to have one or two individual cows in such a herd in which there are lesions in the udder, and not only the milk which they yield is infected, but all the milk of that dairy may become infected by being mixed with it.

A word about muzzling dogs. I am thoroughly in sympathy with the shotgun policy for reducing the number of worthless dogs in our cities. I believe, however, that where an outbreak of rabies exists, and people are exposed to the danger of being bitten by dogs affected with this disease, muzzling is a measure deserving of careful consideration, and even if it is not comfortable for dogs to wear muzzles, I believe this is a justifiable means of prevention. Muzzles are now made which do not seriously interfere with the use of the dog's tongue, and which do prevent the animal from biting people. When there is an outbreak of rabies, this method of prevention should be used, because it is better for us to inconvenience a great many dogs than to allow one person to be bitten and to die from this terrible disease.

A FORMIC ALDEHYDE—ITS PRACTICAL USE.

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To those engaged in public health work, no argument need be presented to prove the pressing need of an efficient gaseous disinfectant, which can be conveniently and safely used, which will destroy all dangerous germs and not injure clothing, paper, or other substances which may be present.

Hitherto, sulphurous acid has most nearly met these requirements, but far from perfectly. In the first place, it has little or no germicidal action unless in presence of moisture, and in the second, it so rapidly oxidizes to sulphuric acid that paper and fabrics are frequently injured by its use. Then, too, it acts so powerfully upon the lungs, that rooms in which it has been used are for a considerable time uninhabitable.

So serious have been the evils associated with sulphur fumigation, that some health boards have given up its use, preferring to rely upon soap and water, bi-chloride of mercury, and other liquid disinfectants, notwithstanding the inconvenience attending their use in disinfecting a room.

In view of these conditions, it has been with more than passing interest that we have read of the recent experiments with the material called formalin, but known in chemistry as methyl aldehyde or formic aldehyde. The remarks of Dr. Kinyoun at the Denver meeting of this Association stimulated this interest still more, and probably at this time very many of you have personal experience with it to relate. Very early in the past year the Maine State Board of Health authorized me to conduct a series of experiments to determine, if possible, the practicability of its use as a gaseous disinfectant by local boards of health. It is the nature and result of these experiments which I shall give in this paper.

It was not the design of the board to have me simply verify or disprove the antiseptic properties of formic aldehyde. We could not but have confidence in the work done in foreign countries bearing upon this point. The main question was, can this material be put into the hands of local boards of health, so that we can have confidence in their results? It is one thing to use a material in a scientific laboratory and an entirely different thing to use it in a tenement-house. The professor of hygiene and the average member of local boards of health are naturally different in mental equipment.

Early in my investigations I became impressed with the fact that the successful use of formic aldehyde as a general room-disinfectant necessitated the formation of very large quantities of it in a short time, and that this must be obtained in a comparatively dry condition.

It is well known that the commercial formic aldehyde, sold also under the name of formalin and other proprietary names, is a water solution of the gas, containing about forty per cent. of the pure substance. This smells strongly of the aldehyde, and in small spaces can be readily used as a source of the gas by pouring it upon sponge or cloth and allowing it to evaporate, which it very readily does.

By so treating a large room, say fifteen feet square, it can be filled with the gas, using, of course, large quantities of the solution. But for some reason the penetrating power and disinfecting action of the gas so prepared, at least in my experiments, is not satisfactory. I do not suppose that the gas is any different in such a case, because in a small space it is perfectly effective, but I imagine that, coming off as it then does, loaded with moisture and cooled by the process of evaporation, it is more sluggish in its movements and penetrates less readily all parts of the space.

It is also true that the use of a very large amount of the solution involves considerable expense.

I next turned my attention to proposed methods of generating the gas directly. This part of the subject has not been neglected by foreign workers.

I will say by way of introduction to it, that the word aldehyde in chemistry is a class name. There are a great many substances to which it is given. In general it is an alcohol dehydrogenated; hence the name al-de-hyde. As a rule an alcohol becomes an aldehyde when by action of oxygen, in limited amount, it loses two atoms of its hydrogen. Methyl aldehyde, ethyl-aldehyde, etc., are thus derived from methyl and ethyl alcohols. But because the aldehydes very easily change into acids they more commonly take their names from the resulting acids, and hence the above aldehydes are called formic, and acetic.

The chemical formulæ show very clearly the change. Thus methyl alcohol $C H_3 O H$ becomes by loss of hydrogen $C H O H$, formic aldehyde, and that, by addition of oxygen, becomes $C H O O H$, formic acid.

Methyl alcohol is made from dry distillation of wood, and used in the arts under the name of wood-spirit or wood-alcohol.

The change of an alcohol to an aldehyde may be brought about in a variety of ways. In the making of vinegar a portion of the alcohol is generally changed to aldehyde, spontaneously. Alcohols heated with certain higher oxides, as of chromium and manganese, are changed to aldehydes. But the most successful and easiest way of making the two above-mentioned aldehydes is to expose the vapors of the corresponding alcohols, mixed with air, to red-hot platinum. In this way formic aldehyde was first made by Hoffman, in 1867. The process can easily be seen by suspending a spiral of thin platinum wire or small piece of sheet platinum over the wick of an ordinary spirit lamp. If the lamp be lighted and then quickly extinguished, the platinum will continue to glow and the aldehyde odor

become manifest. This will produce, of course, formic or acetic aldehyde, according to the alcohol used,—common alcohol giving acetic aldehyde, wood-alcohol giving formic aldehyde. It is upon this principle that lamps have been devised by several foreign scientists to make formic aldehyde for room disinfection. Gambier and Brochet describe such a lamp in the *Revue D'Hygiene*, February 20, 1895. The wick is made as large as possible, and a cone or cap of platinum, perforated, is put over it. The oil is held in a tank at one side, on the principle of a student lamp. With this lamp 100 c. c. of methyl alcohol can be changed to formic aldehyde in an hour. As this is not rapid enough to disinfect ordinary rooms, they had batteries of lamps constructed so that with eight of them 800 c. c. per hour could be changed.

Tollens, in the *Bericht der Deutschen Chemischen Gesellschaft*, describes a lamp on the same general lines, but without the air regulator chimney and tank. It seems to be an ordinary spirit lamp with a cone of platinum gauze over the wick.

Trillat in the *Revue D'Hygiene* for August, 1895, describes a large lamp in which several liters of the alcohol were vaporized by heating the copper cylinder containing it, and the vapor made to pass through capillary openings, and then mixed with an air impinge on hot platinum, or copper, or platinized asbestos. He was enabled to change six liters of alcohol to aldehyde in a few hours. But, of course, this lamp or apparatus required an arrangement for boiling the alcohol.

Dr. A. Diendonnè in the *Arbeiten aus dem Kauserlichen Gesundheitsamte* third part, 1895, describes a lamp devised by himself and Herr Krell, in which the ordinary soldering lamp of the plumber has a platinum cylinder attached to it, so that having first been kindled in the usual manner and the platinum heated, it is then extinguished, and the platinum causes the change into aldehyde to continue as long as the lamp contains alcohol. This lamp has been introduced into this country and is made in three sizes, changing 90 c.c., 200 c.c., 300 c.c. of alcohol to aldehyde per hour.

When I began to experiment, only the Tollens, Gambier and Brochet, and Trillat lamp had been described, and neither of them, so far as I could find, was for sale in this country.

It seemed to me, also, that neither of these could come into general use, for neither made it possible to easily generate the aldehyde in sufficiently large amount. The same objection also applies to the Krell lamp, though it is evidently an improvement upon the others.

My first attempt at a solution of the problem was to use an ordinary lamp with thin platinum, or platinized asbestos, above or surrounding the wick. I found the asbestos better than sheet platinum, but did not succeed in making, in this way, a satisfactory apparatus as to quantity of gas and ease of use. I later devised the following:

I take a disc of moderately thick asbestos board and have it perforated

with small holes close together. This is then platinized in the usual way, using quite a strong solution of platinic chloride. If now a shallow dish, cylindrically formed, and of such size that the perforated asbestos disc will just cover its top, be partly filled with methyl alcohol, it serves as the lamp font. If the platinized disc be wet with the alcohol, seized in a pair of forceps or small tongs, removed from the dish, and the alcohol lighted, it will, by the time its alcohol burns away, be heated sufficiently, so that when placed over the lamp font again it will continue hot and change the alcohol to aldehyde. Experience shows that with proper depth of dish and suitable holes for admission of air, the disc keeps of a proper redness to bring about the change most efficiently. In order to avoid all chance of the alcohol catching fire, and to provide for regulation of the air supply, I have it constructed in accordance with the sample I have here with me. (Prof. Robinson here exhibited his apparatus and explained its construction.)

The advantage of this apparatus is, that it is easily used and the amount of alcohol changed in a given time depends upon the size of the disc. A disc about six inches in diameter serves to change a liter per hour, and this is about as much as is ever wanted. I think, also, that this form of apparatus gives a larger yield of aldehyde than any other. It exposes a much larger surface of platinum to the alcohol and air than any other, and keeps it of a more uniform temperature; and I have no doubt but what this is the reason why my experiments show a less amount of alcohol needed to disinfect a room than those of Trillat. I am very sure that the blast form of lamp as devised by Krell must discharge considerable amounts of alcohol unchanged; in fact, I know it does, for I constructed such a form of apparatus after abandoning the wick lamp, and tested it to my satisfaction. Having constructed a lamp in the manner described, I next undertook a series of experiments, which in general tended to confirm the results of others. I will speak only of those which had to do with room disinfection.

I selected a room containing about 3,000 cubic feet and having three large windows with very loose sash. I found that one liter of alcohol used and the room closed for four hours was not enough to completely sterilize infected matter, if it was covered up or concealed to any great extent, but when two liters were used, or even one and a half, complete sterilization resulted in about three and one half hours. I mean complete destruction of diphtheria and typhoid cultures, and no turbidity in any of the cultures within two days. Occasionally, after five or six days, a slight growth of the hardier molds would appear in some of the cultures, as other observers have noticed.

The remarkable penetration of the substance was shown by the fact that all parts of clothing, including seams, inside of pockets, etc., were sterilized in all parts of the room. Typhoid bacillus was destroyed even when buried half an inch deep in sand.

But, perhaps, the most remarkable results were obtained from bedding. Cultures of typhoid and diphtheria were placed under the clothes, under the pillows, and even within the mattress, and found killed by two liters of alcohol in seven hours. The same result was obtained when cultures were rolled up in a mattress and the whole tied into as compact a bundle as possible.

The reason of the remarkable penetrating power of the gas is undoubtedly in the fact that when hot it is of almost the same specific gravity as air, and hence, readily mixes with air and has no tendency to separate out. But, while its specific gravity is favorable to its penetration, it is also favorable to its escape from a room; hence it is very quickly removed from a room upon opening doors and windows. It also escapes readily from all leaky places in a room. This is why results in small, close chambers or boxes are far different, in amount needed, from those in large rooms. The more open the room, the more must be used. It is for this reason that I am of the opinion that effective house disinfection cannot be most economically done by generating the gas in a single room and allowing it to pass through open doors and stairways. In my judgment, three quarts burned in three different parts of a house would be as effective as six burned in one place. It is, however, rather rare that a whole house needs disinfecting.[1] Commonly a single suite of rooms, not more than two in number, are infected. Two quarts of alcohol burned in one of them and the rooms kept closed for from three to four hours would, I think, be sufficient.

I do not believe that it would be at all safe to burn less than a quart in any ordinary living room. (It will be noticed that the room I used was considerably larger than an ordinary house room.) As I said at the beginning, I do not intend to weary this Association with details of experiments, but have confined myself to results. In the report of the Maine State Board of Health, all details will be given for future reference. I will, however, note some of the most interesting articles which have been written on the subject, for the benefit of those who may wish to consult them.

I will add, also, that the bacteriological work was done by my assistant, Dr. B. L. Bryant, and that we have made experiments upon book disinfection and other uses of formaldehyde, which we hope to publish later.

Hofmann: Liebig's Annalen, Vol. 145, 1867.

Lehmann, Gegner, Blum: Munschen Medicinische Wochenschrift, No. 32, 1893.

Phillip: Muns. Med. Woch., No. 47, 1894.

Miguel: Annales de Micrographie, 1894-5.

M. Trillat and others: Revue D'Hygiene, Vol. XVII, No. 3, 4, 5, 8.

Slater: London Lancet, April, 1894.

[1] Since writing the above I have disinfected a large house of sixteen rooms, using ten gallons of wood-alcohol, doing the whole with three lamps in about eighteen hours.

Giornale Della Reale Societa Italiana D'Igiene, 1894, No. 7.
Cambier and Brochet: Revue D'Hygiene, No. 2, 1895.
Tollens: Berichte Deutschen Chemischen Gesellschaft, 28, No. 3.
Diendonnè: Arbeiten aus dem Kaiserlichen Gesundheitsamte, Vol. XI, No. 2.
Domischen: Same: Vol. XI, No. 3.

A CONVENIENT LAMP FOR THE GENERATION OF FORMALDEHYDE GAS AND A METHOD OF DETERMINING THE AMOUNT OF THIS GAS IN A GIVEN SPACE.

By E. A. DE SCHWEINITZ, PH. D., M. D.,

Chief Biochemic Laboratory, Department of Agriculture, Washington, D. C.

In connection with experiments in trying the effect of formaldehyde gas upon the cattle tick some time ago, I had occasion to construct a lamp for the generation of this gas, which is very easy to use and may prove of service for purposes of disinfection.

The principal value lies in a wick which is so prepared that it will convert wood-alcohol into formaldehyde gas. An ordinary lamp wick is taken, either round or flat, and to the top is attached by wire a piece of sheet asbestos about one and one half inches in length. The asbestos is impregnated with platinum and copper or with one of these alone. The wick is then placed in any ordinary lamp which it will fit. The lamp is filled with wood-alcohol and the capillary attraction of the wick draws up a sufficient quantity of alcohol, which, passing over the impregnated asbestos, is oxidized by the oxygen of the air to formaldehyde gas. A lamp with a central draft like a Rochester burner, or a student's lamp gives the best results, though lamps with flat wicks may also be used. In starting the lamp, it is lighted and allowed to burn for a minute until the asbestos begins to glow. The flame is then blown out but the asbestos will continue to glow as long as there is any alcohol in the lamp.

In trying the effect of this gas upon cattle ticks, I found that the young ticks are easily killed by an atmosphere containing 1½ to 2 per cent. of this gas. The old ticks are but slightly affected by an atmosphere containing 5 per cent. of the gas. An interesting point, however, developed in this connection, was noted, viz., that a calf kept in an atmosphere of five per cent. of this gas for three hours was not greatly inconvenienced. It coughed a few times, and there was a little watering from the eyes and nose, but as soon as removed to the fresh air it seemed to be entirely well and showed no bad after effects.

To what extent this fact can be utilized in disinfecting stables and the like, can be learned only by further experiment. The value of formaldehyde gas or its solutions has been very thoroughly worked out in France and Germany and by numerous experiments in this country, some of which have been presented to you already, so that it is needless for me to repeat.

The value of this gas, however, as a germicide, as an insecticide, as shown upon moths, and parasiticide, makes it useful to have a method at

hand which will permit of a ready determination of the amount of gas in a given space.

Applying principles well known, with the assistance of Mr. Emery, I have developed a method which promises to be satisfactory.

The sample of air to be analyzed is measured in a gas burette and then passed into an absorption burette (Hempel) which contains a solution of alkaline permanganate of potash, or sodium hydrate solution, or ammonium hydrate. After the absorption of the gas the residual volume is again measured, from which the percentage can be easily calculated. If Am. hydrate is used for the absorption, the residual air must be washed in a sulphuric acid burette before noting the final volume.

If none of the alcohol is wasted while being converted into the aldehyde, a liter of the wood-alcohol will give 5 per cent. aldehyde in a room 10 x 10 x 10. The Sp. Gr. of formaldehyde gas is 1.6 air=1.

1 c. c. of the gas weighs .00207 grams and 1 liter pure wood-alcohol converted into the aldehyde gives 748 grams aldehyde=36,100 c. c. gas.

From these data it is easy to calculate the amount of pure alcohol that must be used in order to obtain a definite volume and percentage of the gas. The lamp described will burn in a confined space until nearly all of the oxygen in the air is exhausted.

The fact that this gas and its solutions are practically without injurious effect upon metal, wood and cloth, and most colors, and the minute amount necessary to secure the destruction of bacteria, makes formaldehyde practically the best gas yet known for disinfecting purposes.

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All communications should be addressed:

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THE BUFFALO MEETING AND THE ASSOCIATION FROM A MEDICAL STANDPOINT.

We take pleasure in inserting herewith an editorial from the *Journal of the American Medical Association.* It gives a very complete statement of the work accomplished at the Buffalo meeting, as well as of the status of the Association:

The mere enumeration of the reports of special committees and individual papers read at the recent meeting of the American Public Health Association at Buffalo, N. Y. (September 15-18), is sufficient evidence of the amount of scientific sanitary inquiry accomplished. Four addresses, sixteen reports of committees, and fifty-three papers—seventy-three in all—constitute a formidable list, and when to these are added the discussions on these reports and papers, which are arranged in groups according to subjects, these discussions being a characteristic of this body, which it encourages and on which it justly prides itself, its reputation as a working body cannot be questioned. The Association was actually in session eight hours on the first day, eight on the second, nine on the third, and five on the fourth, a total of thirty, the general business occupying scarcely an hour each day. Giving thirty minutes to each report and limiting voluntary papers to twenty, of which only five were read by title, and restricting discussions to five minutes, it will be seen how well the time was filled, a result accomplished only by the admirable business methods of this excellent body. The unflagging interest of the old members was shown by the fact that nine of the thirteen surviving ex-presidents were in attendance and very actively engaged on duty as members of the Executive Committee. Prof. Stephen Smith of New York city, the founder of the Association and its first president (1872, '73, and '74) in his ad-

dress in acknowledgment of his enthusiastic welcome at Buffalo declared he was especially gratified at discovering the Association still adhered to its early practice of doing its administrative business through an executive committee, thus taking the disputations and hysteric jangling, by which so much time is wasted in many large associations, off the floor and permitting the legitimate work for which the Association was organized, to be performed. Every resolution offered is read and, upon being seconded, referred without debate to the Executive Committee, by which it is carefully considered, amended, if thought best, in substance or language, and referred back the following day to be put upon its passage, or quietly tabled in committee. The confidence in the conclusions of the committee is such that debate seldom occurs and dissent rarely. The composition of the committee justifies this confidence. The five officers, six elected members, of whom three are renewed annually, and the ex-presidents, secure a judiciary of old and experienced members. Occasionally some disappointed proposer of a resolution, on finding his hobby not reported, jumps up with an amendment to the constitution changing the composition of the committee, usually by leaving out the ex-presidents, but a year of sober reflection before the retaliating amendment can be considered, has heretofore saved the Association the loss of what may be considered its balance-wheel. The participation of the former presidents preserves a constant policy and preserves it from local influences, log-rolling and hasty, injudicious legislation.

The duty of the Executive Committee is no sinecure. It assembles early on the day preceding the annual meeting and is in session the greater part of that day and subsequently daily from 8 or 9 to 10 a. m., and usually at night after the adjournment of the evening general session, often when matters of importance have been referred to it continuing its work until two or three o'clock in the morning. The Executive Committee investigates every application for membership and determines whether to recommend the applicant for election. As stated, it considers every resolution introduced into the Association, amending it as it may believe proper, or changing its phraseology. It examines all papers and prepares the daily programmes, and generally discharges all the working duties of the Association. An Advisory Council, consisting of one member from each state, territory, the District of Columbia, the army and navy of the United States, the Marine Hospital Service, the Dominion of Canada and each of the provinces, and each state, territory, and the federal district of the republic of Mexico, besides acting as a nominating committee of officers and selecting the place of meeting for the ensuing year, also considers important questions of policy and makes such recommendations to the Association as shall best secure its objects. Through this council, which is virtually a senate of over eighty members, the equal representation of all the constituent nationalities and states is obtained, and its recommendations in matters of vital importance have always been sustained.

At the meeting just ended, however, its selection of the place of meeting for 1897 was reversed for reasons that had not been presented to it.

The Executive Committee, the Advisory Council, and the Publication Committee (the last consisting of the secretary and two members residing conveniently near him), are the three standing committees, and practically do all the general business, and the splendid uniform series of volumes of its transactions for the twenty-four years of its existence are speaking testimony of the value of its sanitary work, constituting a hygienic library containing information which Florence Nightingale declared could not be found anywhere in Europe.

The American Public Health Association is characteristically *American*. In 1884 it extended its membership to Canada and in 1890 to Mexico, the membership of both these countries embracing their most distinguished sanitarians and health officers, who have been as regular in attendance, as interested in the work, and as enthusiastic and able contributors as those from the United States. Two annual meetings have been held in Canada, in 1886 and 1894, and that of 1892 in Mexico; and both Ottawa and Toronto contended for the meeting in 1897.

An especially commendable feature of this Association is that it is in no sense a junketing body. It goes where it hopes to do good and devotes itself to that end. It asks no courtesies and is prepared to assume all the expenses of its meetings. Nevertheless, civilities have been everywhere generously showered upon it and accepted, conditional upon their non-interference with its legitimate work. At Buffalo the local committee arranged its excursions after the formal adjournment, only requesting that one night might be assigned for a reception at the Ellicott Club, but an interesting paper induced the members to meet before the reception and hold a session of a couple of hours before presenting themselves at their hosts'.

The system of special committees, covering almost the whole ground of public hygiene, secures a concert of inquiry. At Buffalo, sixteen of the seventeen special committees (now numbering twenty) actually presented reports, and an examination of the authorship of these reports and of the individual contributions, shows that all but five or six of the seventy-three writers hold or have held responsible representative positions as members of state and provincial boards of health and of the Superior (national) Board of Health of Mexico, as health officers of cities, and as government officials of the United States army and navy and the department of agriculture, thus directing their several lines of inquiry in common channels. Dr. Stephen Smith claims for the Association the credit of having developed the system of state and provincial boards of health into its present proportions. Originally the subject of a special committee, whose work grew so large that a whole session was devoted to it exclusively, becoming later a conference of state boards of health, meeting at first coincidently with the Association and later independently, the new organization has never lost interest in the parent body, as shown by the numbers

of presidents, secretaries, and members of state and provincial boards of health who participated in both the business and sanitary work of the late meeting as chairmen and reporters of special committees, authors of papers, and disputants in the discussions. Perhaps the crowning glory of the American Public Health Association has been the establishment of a fraternal union of the United States, Canada, and Mexico in one body, in which international distinctions are abolished, and the sanitary officials of the three countries harmonized in the interests of a common humanity in a mutual policy of protection against epidemic importations.

INDUSTRIAL HYGIENE.

The Parliamentary Committee, appointed to report upon certain dangerous trades, has issued another report upon the following occupations, the dangers incident to them, and recommendations for its prevention: Bronzing in lithographic works, paper staining, coloring, and enameling; the use of steam locomotives in factories, india-rubber works, the use of inflammable paints, dry cleaning (*i. e.*, with naphtha or benzine), and the manufacture of aërated waters.

The inquiries of the committee embraced 134 works, or factories, in England, Scotland, and Ireland.

BRONZING.

This occupation is carried on in lithographic printing works, in the manufacture of show cards, Christmas cards, illuminated texts, etc. The bronze powder is prepared in Germany and is variable in quality and color. It contains copper and zinc and about 0.12 per cent. of arsenic. In the silver-bronze, tin and antimony are substituted for the copper. The process is of two kinds: hand and machine bronzing.

No absolute or specific disease is traceable to this process. The committee saw girls, women, and boys literally covered with the bronze dust, who admitted that it gets down their necks and under their clothing; that it irritates the skin; that they suffer from headache, constipation, bad taste in the mouth, loss of appetite, drowsiness, anæmia, skin eruptions, catarrh, and general malaise.

The inspection of factories supports the findings of the committee and adds that "the effects, if taken in quantities, such as might be expected in the case of any person breathing a bronze-laden atmosphere for any length of time, are severe diarrhœa, vomiting, and violent nausea."

PREVENTIVE MEASURES.

The committee recommend—

1. That no young person of either sex should be employed in bronzing, or "dusting off."

2. Overalls and head covering should be supplied, of such a color as to show the bronze. These should be washed at least once a week.

3. All persons desiring respirators should be supplied. These should be washable and changed not less than three times a week.

4. A place should be provided for the workers in which to change and leave their clothes.

5. No food should be eaten by any one in the room where bronzing or "dusting off" has been carried on during the day.

6. Extreme cleanliness is urged; also the provision of lavatories and bath-rooms supplied with hot and cold water, soap, towels, and nail brushes.

7. Printing in size to be performed in a separate room from the bronzing and "dusting off" room.

8. Milk to be supplied twice a day to the workers, and the milk to be supplied as milk, and not its price in money.

9. All persons employed, to be examined once a month by a surgeon, who should have power to order temporary or total suspension of work.

10. A register to be kept, containing the date and result of his visit and his requirements.

11. All cases of illness attributable to bronze-working to be reported to the District Factory Inspector.

PAPER STAINING, COLORING, AND ENAMELING.

The committee calls attention to the early investigations upon these occupations and the fact that great improvement has followed the report of 1880, before which wall papers were found to contain as much as 59 per cent. of arsenite of copper. At the present time, the poisonous colors are found to be almost entirely substituted by harmless colors, and arsenical poisoning from this source has become extremely rare. Still, the committee found certain conditions and processes which called for reform.

The chief dangers in this industry appeared to be due to those arising from intense heat in the work-rooms, bad ventilation, and the danger incident to dusty processes—especially those of bronzing, "dusting off," flocking, mica-dusting, and the processes entailed in satin work.

For the prevention of these dangers, the committee made recommendations nearly identical with those which applied to the workers in bronzing works, with the following additional clauses:

12. In all places where the temperature in winter reaches 75° F. or 90° F. in summer, and in all places where the foregoing dusty processes are conducted, the committee recommends the employment of a fan, or other means of artificial ventilation.

13. All work, so far as possible, should be prohibited in rooms or stores where paper is dried, which should be separated from the machine or other work-rooms.

STEAM LOCOMOTIVES IN FACTORIES.

The committee found that trains, trucks, locomotives used in steel works, blast furnaces, chemical, and engineering works were a fruitful source of injury.

The recommendations were mainly as follows:

1. The use of coupling sticks or automatic couplers.
2. Footways three feet wide on each side of rails and between them and any fixed structures.
3. No heaps of rubbish to be deposited within three feet of the rails.
4. Overhead railway platforms to be provided with hand-rails not less than four feet from the railway line. The platforms to be properly constructed and kept in good repair.
5. A "stop-block" to be supplied at end of all platforms.
6. Firemen to be supplied with "chucks" or "scotches" for the wheels, when train is at rest on a grade.
7. Provision for protection at grade crossings.
8. Drivers not to be allowed to move engines during meal-time.
9. No man to be employed as fireman under seventeen years of age.
10. All engine drivers to have certificates of training.
11. Time to be allowed to wash and clean engines.
12. Use of danger signals prescribed.
13. Use of long chains to connect cars to locomotive to be prohibited.
14. "Props" used for pushing train on a separate track from locomotive, to be made of strong timber and to be hooped with iron.
15. The word "locomotive" in all special rules to include traveling cranes moved by power.
16. Red lights to be used on trains at night.
17. No locomotive to pass by grade crossings at a speed of more than four miles per hour.
18. Whistles to be used at grade crossings.

INDIA-RUBBER WORKS.

The committee describes the different processes employed in the manufacture of rubber goods, and calls attention to the fact that the principal source of danger lies in the employment of carbon bisulphide for vulcanizing. This process is usually conducted at the top of the building, because the smell arising from this compound is well known to be penetrating, nauseous, and injurious.

The evidence brought before the committee showed that naphtha fumes also evolved in another part of the manufacture were productive of serious inconvenience, which, if continued, tends to undermine the constitution.

Dr. Arlidge, one of the medical experts examined, testified that faintness, headache, general lassitude, and disinclination for food, resulted

from the breathing of naphtha fumes. Often the workers were obliged to leave the factory and go out into the fresh air to seek relief from the overpowering fumes of naphtha. They "taste the naphtha when they go home at evening, and when they wake in the morning, which makes them disinclined to partake of food."

The breathing of the vapor of bisulphide of carbon is worse still. Cases were brought to the notice of the committee of persons prone to temporary insanity, where the windows of the room in which they worked had to be barred to keep them from precipitating themselves below. The committee saw "men and girls (operatives of this class), who had lost the use of their hands and legs."

One man of five years' experience in this business, who had been paralyzed, said, "In my opinion, it ought not to be done at all. It is a cruel business."

At Edinburgh, many rubber workers were admitted to the Royal Infirmary and the Victoria Hospital for consumption. One physician reported seventy cases of rubber workers in eight years, most of whom suffered from respiratory complaints. In the Edinburgh Infirmary, out of twenty-five female rubber workers, five were treated for dyspepsia, five for anæmia, two for hysteria, one for pericarditis, two for Bright's disease, and the remainder for various complaints. Of twenty men (rubber workers) five were treated for bronchitis, four for locomotor ataxia, and two for chronic Bright's disease.

Stringent regulations in regard to the employment of persons in this occupation, are enforced in Germany, France, and Belgium.

The following measures are recommended by the committee:

1. Mechanical and adequate ventilation to be provided in all "spreading" rooms.

2. In the making-up rooms, the cubic air-space to be not less than 500 feet for each worker.

3. No young person under sixteen years of age to be employed in the "mixing," "spreading," or "making-up" rooms.

4. All receptacles containing naphtha to be provided with lids and to be kept covered when not in use.

5. In rooms where carbon bisulphide is used, no young person should be employed, and no one to be employed more than five hours per day, and not more than two and one-half hours at a time without an interval of at least one hour.

6. In vulcanizing with bisulphide of carbon, the trough containing this liquid should be self-feeding and kept covered, and the cloth should be conveyed to the drying chamber by an automatic machine. No person should be allowed to enter this drying room in the ordinary course of work.

7. In the cold vulcanizing of many articles, all dripping should be done in enclosed cupboards or boxes provided with a fan, so arranged that the

fumes may be drawn away from and not across the faces of the workers.

8. In all rooms where waterproof cloth is vulcanized by carbon bisulphide, the machine should be covered and provided with a downward motion fan.

9. No food should be eaten in any part of the factory where naphtha or carbon bisulphide is used.

10. In all factories where more than twenty persons are employed, a suitable dining-room should be provided.

11. Provision should be made for monthly medical examination of all young persons and women, the medical officer to have power to suspend work.

12. Register to be kept of medical visits and requirements.

13. All cases of illness to be reported to the district inspector of factories.

THE USE OF INFLAMMABLE PAINTS.

These paints are chiefly used in the painting of ships, and for the pur pose of saving time in port. Quick drying paints are therefore employed composed of methylated spirit, or benzine instead of oil, and mixed with the proper colors. They are all very volatile and inflammable. The dangers in their use consist in the risk of fire, and the risk of intoxication followed by unconsciousness, and asphyxiation by the inhalation of the fumes, the latter resembling drunkenness. There is also nausea, vomiting, loss of appetite, colic, and bleeding at the nose and ears, with temporary dementia.

The committee believed that the risk of fire is more than doubled by the danger of intoxication and asphyxiation, since, where the latter takes place, a fire commonly ensues, and where both occur, one resulting from another, grave and often fatal results are the consequence.

The committee presents several illustrative cases of serious and fatal injuries occurring in this occupation.

The committee recommended that:

1. No confined spaces on board ship should be painted with a spirit composition or paint, the flashing point of which is below 100° F.

2. No such paint to be used by a workman carrying a naked light.

3. No man working with such paints to be employed upon it for more than five hours a day, nor for more than two and one half hours at a time without a break of at least an hour.

4. No young person to be allowed to work with such paint.

5. When less than three men are employed in the use of an inflammable paint, they should receive a visit from the foreman at intervals of not more than one hour.

DRY CLEANING.

This process is the cleaning of gloves, garments, etc., with benzine, and is often conducted on a small scale in kitchens or cooking-rooms, but on a large scale involves the use of machinery and large numbers of people.

The dangers are like those of the last-named occupation, the risk of fire and the injurious effects of inhaling the volatile spirit.

The recommendations consist mainly in the construction of machines with covers so arranged as either to prevent fire, or, if the spirit takes fire, the cover must be so made as to fall and extinguish it. The spirit should be run off in closed pipes. Sand and blankets in abundance should be kept handy for extinguishing flames. Men employed should wear woolen shirts. All upper rooms should have fire-escapes. All cleaning factories to have abundant water supply. Lights to be incandescent electric burners, well protected with outside globes. Ventilation of great importance, and should give 500 feet of air-space to each operator. Monthly medical examinations to be made and register kept. No food to be eaten in work-rooms, where spirit is used for cleaning. Where more than twenty people are employed the superintendent should provide a dining-room for the working people.

AERATED WATERS.

The process consists in treating chalk or whiting with sulphuric acid. The gas is collected in a receiver, whence it is pumped into the water to be aërated.

Sometimes the gas is forced into the water before the bottles are filled; in other cases the bottles are filled with water first, and the gas is pumped in afterward. The former is the common practice.

The danger in this industry consists in the risk of being cut more or less severely by the bursting of bottles. The green glass bottles cause a more painful cut, and one which takes longer to heal, than those of clear, transparent glass.

For the prevention of injury, the committee recommends the use of face-guards, masks or veils of wire gauze, gauntlets to come down to the finger joints of full length on one arm, and shorter on the other arm. Machines for bottling should be fenced in so as to prevent harm from bursting bottles.

The committee adds a general recommendation relative to the use of respirators for the prevention of harm from dust of a poisonous and metallic character. They should not only be worn by operators when at work in dusty occupations, but should be kept in a cleanly condition. Dr. Dupiê says, "A perfect respirator should have the following qualities: It should prevent all access of dust to the mouth and nose and perhaps cover the ears; it should not interfere with the breathing or work of the wearer, and should touch the skin as little as possible."

VACCINATION.

The recent epidemic of small-pox at Gloucester, England, is only another of the numerous instances in English towns of the folly of opposing one of the most thoroughly established principles of preventive medicine. This town, which, singularly enough, was in the midst of the very county where Dr. Jenner first made his discovery of the protective power of vaccination, had, like its sister city of Leicester, suffered the practice of vaccination to be seriously neglected, when a severe outbreak of small-pox occurred. In commenting upon this event, and upon the long-delayed report of the parliamentary commission, the *Sanitary Record* of September 4, 1896, says: "The report of the vaccination commission has yet to be fully discussed—for legislation based on its recommendations may by-and-by be looked for—and in all the discussions that must necessarily precede legislative action, we very confidently expect that the efficacy of vaccination will be abundantly illustrated, and indicated, by reference to the neglect of the practice in the ill-fated city of Gloucester. The recent terrible outbreak there has, in common with other local epidemics, been thoroughly investigated by the commission; and the experience thus gained has proved of valuable service in drawing conclusions as to the value of the practice as a preventive. According to report, there is, at the present time, in all probability no better vaccinated town in the kingdom than the place which was recently so absolutely defenceless against the scourge of small-pox, and there can be little doubt that this condition of armed defence will be jealously maintained for many a day to come."

UPON THE OPERATION OF FOREIGN METHODS OF SEWAGE DISPOSAL BY TREATING IT UPON LAND.

The report of the management of the sewerage system of Berlin[1] for the year ending March 31, 1895, shows the cost to have been at the rate of .014 mark, (equal to about 2 mills) per cubic metre, or reckoned upon a different basis, 0.56 mark per capita of the city's population.

Since the sewage fields of Berlin constitute the most extensive example of sewage irrigation in the world, it is a matter of interest to know what effect, if any, is produced upon the population employed to cultivate the fields irrigated. This population living on the sewage fields, in the year mentioned, consisted of 3,032 persons, men, women, and children. Among them there were 29 deaths, or 9.6 per 1,000 of the population. Of these 17 were children under 15 years of age, of whom 11 were under one year.

There were 644 cases of illness, of which 316 were among children

[1] NOTE. Veröffenlichungen des Kaiserlichen Gesundheitsantes, Berlin, July 29, 1896, p. 619.

under 15, and of these 84 were cases of infectious diseases, namely, 47 cases of measles, 19 of scarlet fever, 3 of chicken-pox, 4 of diphtheria, 6 of influenza, 3 of mumps, 1 of cerebro-spinal fever, and 1 of tubercular disease of the brain. There was only one death from typhoid fever during the year, and this was not among the workmen employed on the sewage fields or among their families, but in the person of a public administrator of property who had no connection with the field-work.

The sewage-farms of Berlin had an area, on March 31, 1895, of 22.881 acres, or more than thirty-five square miles. Since the first of January, 1876, there have been discharged upon these fields a total of 143,807 million gallons of sewage.

It is interesting to note that four convalescent homes (two for general patients, and two for tuberculous patients) have been established on these farms, and the results obtained in them are quite encouraging.

Paris, with a population of 2½ millions, at first treated its sewage upon the fields at Genne-villiers, which were enlarged, from time to time, until 1,945 acres were under cultivation. Land farther down the Seine has now been secured in the neighborhood of Achères, where about 2,000 acres have been purchased for the same purpose.

VITAL STATISTICS.

The following are the advance figures resulting from the tabulation of the vital statistics of England for the year 1895.

The final figures, which will be published in the registrar-general's annual report about a year later, usually differ but slightly from this first count:

Estimated population of England at the middle of the year 1895, 30,394,078.

Births,	921,860.	Birth-rate,	30.4 per 1,000
Deaths,	568,758.	Death-rate,	18.7 per 1,000
Marriages,	227,865.		
Persons married,	455,730.	Marriage-rate,	15.0 per 1,000

Of the births, 468,753 were boys, and 453,107 were girls, being in the ratio of 1,035 boys to each 1,000 girls.

Of the deaths, 290,714 were males, and 278,044 were females, giving an estimated death-rate of 19.7 per 1,000 for males, and 17.7 per 1,000 for females, which is equivalent to 1,113 deaths of males to each 1,000 deaths of females in equal numbers living.

The marriage-rate of London for 1895 was			17.1
birth-rate	"	"	30.4
death-rate	"	"	19.4

THE SOFTENING OF HARD WATER.

Very little attention has been paid in this country to the question of softening hard waters for domestic use and for use in manufacturing processes. An excellent paper by Mrs. E. H. Richards upon this subject appears in the Twenty-Seventh Report of the Massachusetts Board of Health (1895), and it is also quite fully treated in the recent work on water supplies by John C. Thresh.[1] From this work the following notes are taken:

"The hardness of water is due to the presence of compounds of lime and magnesia, chiefly the former. Temporary hardness is due to the carbonates of these bases, and permanent hardness is caused by sulphates, chlorides, and other salts. The chief disadvantages attending the use of hard waters consist in the waste of soap required. Water may be softened (a) by boiling, (b) by distillation, (c) by the addition of lime, with or without carbonate of soda, soda ash, or other chemicals.

(a) By boiling, the carbonic acid gas is driven off, and the carbonates of lime and magnesia, which had been held in solution by this gas, are deposited. This process is expensive and troublesome. It was estimated that the fuel necessary to soften 1,000 gallons of water would cost about $1.85.

(b) Distillation is still more expensive than boiling, but is more effectual, since it separates all the saline ingredients.

(c) The addition of lime. Lime has a great affinity for carbonic acid, combining with it to form carbonate of lime or chalk. The sulphates and chlorides are not affected, so that the permanent hardness is not reduced. An excess of lime must not be added, since the excess will again increase the hardness. This process is the most economical, and is the one now usually adopted. The approximate price of a plant capable of softening 1,000 gallons per hour by this process is stated as about $1,000; for softening 2,000 gallons, about $1,400. The system is employed on the London and North-Western Railway for softening 1,000,000 gallons daily for locomotive use.

Mr. Thresh describes several forms of apparatus employed for this purpose, the Porter-Clark, the Stanhope, Howetson, and others, and presents a table giving the cost of softening 1,000 gallons at different degrees of hardness. He also estimates the saving per million gallons to a town supplied with hard water, where the hardness is reduced by 16° (Clark's scale), at about £65, or $325; or about $115,000 a year to a city of 30,000 inhabitants.

The following extracts from a report of the Metropolitan Asylums' Board shows the saving effected by employing this process in certain English public institutions, containing about 1,800 inmates.

[1] "Water and Water Supplies," by John C. Thresh, D. S. C., M. B., etc., London, 1896.

	£	s.	d.
Saving in value of soap and soda	300	0	0
Value of material and labor saved in replacing steam and hot-water pipes, boilers, etc.	384	0	0
Reduced annual wear and tear of steam boilers	240	0	0
Saving of coal	56	0	0
	980	0	0

Deduct working expenses:	£	s.	d.			
Cost of lime	38	17	0			
Cost of renewing filter cloths	20	0	0			
Proportion of engineers' wages	50	0	0			
				108	17	0
Total estimated amount saved during year				871	3	0

Added to this great annual saving of about £871 (equal to about $4,300), the board calls attention to the saving in the wear and tear of linen on account of being washed in softened water. Economy in this wear and tear of boilers, culinary utensils, and in the consumption of tea, is also shown.

In addition to these advantages, Professor Frankland found that the bacteria in the water softened are decreased by the process, since they become entangled in the precipitate and settle to the bottom of the tanks.

ERRATUM.—An error has been found in Dr. Kennedy's paper on "The Composition and Infectiousness of Milk," on page 333; the words "Solids (not fat) . . . 90,000" should be omitted.

NOTICE TO NEW MEMBERS.—Members elected at the Buffalo meeting, who have paid their dues, are entitled to the JOURNAL for the year 1897; but inasmuch as this issue contains some of the papers read at Buffalo, a copy of this number will be sent complimentary to all new members.

NOTICE.—This number completes Volume XXI of the regular series of the publications of this association. Members who have paid their dues for the current year may have the Quarterly bound uniformly with the preceding volumes, free of expense, by returning the four numbers to the secretary.

REVISED LIST OF MEMBERS

AMERICAN PUBLIC HEALTH ASSOCIATION,

1896.

This list includes those who have maintained their membership to the present time. The Secretary should be notified of any errors or omissions.

PRESIDENTS OF THE ASSOCIATION.

Stephen Smith, M. D.	1872, '73, '74
*Joseph M. Toner, M. D.	1875
*Edwin M. Snow, M. D.	1876
*John H. Rauch, M. D.	1877
*Elisha Harris, M. D.	1878
*James L. Cabell, M. D.	1879
John S. Billings, M. D.	1880
*Charles B. White, M. D.	1881
Robert C. Kedzie, M. D.	1882
*Ezra M. Hunt, M. D.	1883
Albert L. Gihon, M. D.	1884
*James E. Reeves, M. D.	1885
Henry P. Walcott, M. D.	1886
George M. Sternberg, M. D.	1887
Charles N. Hewitt, M. D.	1888
*Hosmer A. Johnson, M. D.	1889
Henry B. Baker, M. D.	1890
Frederick Montizambert, M. D.	1891
Felix Formento, M. D.	1892
Samuel H. Durgin, M. D.	1893
Emmanuel P. Lachapelle, M. D.	1894
William Bailey, M. D.	1895
Eduardo Licéaga, M. D.	1896
Henry B. Horlbeck, M. D.	1897

MEMBERS.

Dr. Samuel W. Abbott	Wakefield, Mass.	1882
Dr. Herman Jacoby Achard	Manchester, N. H.	1894
Prof. J. George Adami, M. D., Prof. Pathology McGill University	Montreal, P. Q.	1893

*Deceased.

Dr. CHARLES EVERETT ADAMS, Director of Gymnasium, Rogers' College. . . . . New Brunswick, N. J. 1894
Dr. CHARLES W. ADAMS . . . . . Kansas City, Mo. 1891
Dr. E. HERBERT ADAMS, Member of Committee on Public Health, Ontario Medical Association, 86 Hazelton Ave., Toronto, Ont. 1894
Dr. J. F. A. ADAMS . . . . . Pittsfield, Mass. 1881
JOHN G. ADAMS, L. D. S. . . . . 346 Yonge St., Toronto, Ont. 1894
C. H. ALDEN, U. S. A. . . . . Washington, D. C. 1887
Dr. A. C. ALEXANDER, Member Board of Health, . Penacook, N. H. 1896
Col. D. S. ALEXANDER . . . . . Buffalo, N. Y. 1896
Dr. EDWARD ALEXANDER . . . . . El Paso, Tex. 1892
EDWIN R. ALLEN, V. S. . . . . Kansas City, Mo. 1891
Dr. THOMAS G. ALLEN . . . . . 439 Elk St., Buffalo, N. Y. 1896
Dr. T. JOHNSON ALLOWAY, Professor of Gynecology, McGill University . . . . . 23 Mackay St., Montreal, P. Q. 1894
Dr. MAXMILEAN ALVAREZ . . . . . Toluca, Mex. 1896
Miss MARY B. ALWARD . . . . 55 Johnson Park, Buffalo, N. Y. 1896
Dr. B. P. ANDERSON . . . . . Colorado Springs, Col. 1895
JOHN A. ANDERSON . . . . . Lambertville, N. J. 1887
Mr. SCOTT J. ANTHONY . . . . . Denver, Col. 1895
Mr. U. E. ARCHAMBAULT, Director General of Montreal Catholic Schools . . . . 1999 St. Catharine St., Montreal, P. Q. 1894
Dr. S. T. ARMSTRONG . . . . . New Rochelle, N. Y. 1892
Dr. J. S. ARWINE . . . . . Columbus, Ind. 1882
Dr. JOSEPH ASSELIN . . . . 111 St. Dennis St., Montreal, P. Q. 1894
Mr. JOHN ATKIN . . . . . 158 Metcalfe St., Montreal, P. Q. 1894
Hon. EDWARD ATKINSON . . . . . Boston, Mass. 1889
Dr. ALPHONSE DAVID AUBRY . 261 St. Antoine St., Montreal, P. Q. 1894
Dr. HENRY NEWELL AVERY, Commissioner of Health, 2548 Nicollet Ave., Minneapolis, Minn. 1895
Sr. MELCHOR AYALA . . . . . Guanajuato, Mex. 1896
Dr. WARREN L. AYER . . . . . 185 Main St., Owego, N. Y. 1896
Dr. FRANCISCO MARTINEZ BACA . . . . . Puebla, Puebla, Mex. 1892
Dr. MORGAN L. BACON . . . . . Main St., Wellsboro, Pa. 1896
Dr. HENRY I. BAHNSON . . . . . Salem, N. C. 1888
Dr. WILLIAM BAILEY . . . . . Louisville, Ky. 1879
Dr. WILLIAM C. BAILEY . . . . 614 Walnut St., Las Vagas, N. M. 1892
Dr. WILLIAM O. BAILEY . . . . . 1403 Orlmsby, Louisville, Ky. 1892
Dr. P. H. BAILHACHE, U. S. M. H. S. . . . . Stapleton, N. Y. 1874
Dr. HENRY B. BAKER . . . . . Lansing, Mich. 1873
Dr. F. W. BALDWIN . . . . . Danvers, Mass. 1896
H. J. BALL, G. W. P. A., D., L. & W. R. R. . . . Buffalo, N. Y. 1896
Dr. F. BANCROFT . . . . . Denver, Col. 1887
Dr. F. J. BANCROFT . . . . . 397 Grant Ave., Denver, Col. 1895
Dr. CHARLES EDWARD BANKS, U. S. Marine Hospital Service . . . . . Portland, Me. 1894
Sr. MARIANO BARCENA, Director del Observatorio Central, Mexico, Mex. 1892

Dr. WILLIAM F. BARCLAY . . . . 1620 Fifth Ave., Pittsburg, Pa. 1895
Dr. GEORGE E. BARIL . . . . 324 St. Catherine St., Montreal, P. Q. 1894
Dr. HENRY JABEZ BARNES . . . . 429 Beacon St., Boston, Mass. 1896
Dr. GEORGE W. BARR . . . . . 18 Washington St., Titusville, Pa. 1896
Dr. FELIX BARRETT . . . . . Westbrook, Me. 1894
Dr. EDWARD P. BARTLETT, Secretary Illinois Army and Navy Medical Association . . . . 514 Capital Ave., Sangmon, Ill. 1894
JAMES W. BARTLETT . . . . . Dover, N. H. 1888
Dr. ELIAS HUDSON BARTLEY . . . 21 Lafayette Ave., Brooklyn, N Y. 1890
Dr. NEWTON L. BATES, Medical Director U. S. Navy, Director U. S. Naval Museum of Hygiene . . . Washington, D. C. 1895
Dr. SAMUEL W. BATTLE, U. S. A. . . . . Asheville, N. C. 1887
Dr. JOSEPH BEAUDIN, Officier de Sante . . . . . Hull, P. Q. 1894
Dr. J. A. BEAUDREY . . . . . 65 St. Denis St., Montreal, P. Q. 1889
Dr. FREDERICK BECKER . . . . . Clermont, Iowa. 1889
Dr. D. H. BECKWITH . . . . . Cleveland, Ohio. 1884
Dr. HENRY E. BEEBE . . . . . Sidney, Ohio. 1882
F. L. BEIQUE, Esq., Queen's Counsel, 954 Sherbrooke St., Montreal, P. Q. 1894
Dr. A. N. BELL . . . . . 337 Clinton St., Brooklyn, N. Y. 1872
Dr. JAMES BELL, President Montreal Medico-Chirurgical Society . . . . . 873 Dorchester St., Montreal, P. Q. 1894
Dr. NORMAN W. BELLROSE, City Physician and Health Officer . . . . . Eaton, Col. 1895
Dr. J. M. BENITEZ . . . . . Guadalajara, Jalisco, Mex. 1892
Dr. EMMANUEL PERSILLIER BENOIT, 476 Sherbrooke St., Montreal, P. Q. 1894
MORRIS BENSON . . . . . Buffalo, N. Y. 1896
Dr. DAVID H. BERGEY . . 34th and Locust Sts., Philadelphia, Pa. 1894
Dr. FRANCISCO BERNALDEZ . . . Estampa-Merced 5, Mexico, Mex. 1892
Mr. L. A. BERNARD . . . 1882 St. Catherine St., Montreal, P. Q. 1894
Dr. MICHAEL BESHOAR. . . . . Trinidad, Col. 1895
Dr. JOHN S. BILLINGS, U. S. A. . . . . Philadelphia, Pa. 1872
DR. H. A. BIRKETT, Lecturer in Laryngology, McGill University . . . . . 123 Stanley St., Montreal, P. Q. 1894
CHARLES F. BISHOP . . . . . Seneca St., Buffalo, N. Y. 1896
Dr. WILLIAM T. BISHOP . . . . . Harrisburg, Pa. 1889
ARTHUR D. BISSELL . . . . . People' Bank, Buffalo, N. Y. 1896
Hon. WILSON S. BISSELL . . . . . Ellicott Sq., Buffalo N. Y. 1896
Dr. A. D. BLACKADDER, Professor of Pharmacology and Therapeutics, McGill University . 236 Mountain St., Montreal, P. Q. 1894
Dr. EMILY BLACKWELL . . . . . 53 E. 20th St., New York City. 1873
E. W. BLATCHFORD . . . . . 375 No. La Salle St., Chicago, Ill. 1876
Dr. VICTOR ALEXANDER BLES . . . 1274 Marion St., Denver, Col. 1895
Dr. FRANS H. BODENIUS . . . . . Madison, Wis. 1888
ADAM BOECKEL . . . . . Seneca St., Buffalo, N. Y. 1896
Dr. MARY A. BOLAND, ... 117 West Newton St., Boston, Mass. 1891
ALEXANDRE BONNIN, I. C., Professor á l'Ecole Polytechnique . . . . . 247 St. Hubert St., Montreal, P. Q. 1894

Frederic Hathaway Borradaile	41 Michigan Ave,, Detroit, Mich.	1893
Dr. Seraphin Boucher	1133 Ontario St., Montreal, P. Q.	1894
Dr. Abraham H. Bowers	5 East 2d St., Jamestown, N. Y.	1896
Dr. Asa B. Bowers	Jackson, Iowa.	1893
Dr. A. H. Bowker, Health Officer	Berlin, N. H.	1896
Dr. Elmer Thomas Boyd	Leadville, Col.	1895
Dr. Henry Martyn Bracken, Member State Board of Health	1010 Fourth St., Minneapolis, Minn.	1895
William H. Bradish, Real Estate Exchange	Buffalo, N. Y.	1896
Dr. Harry E. Bradley, Acting Commissioner of Health	208 Wisconsin St., Milwaukee, Wis.	1895
Dr. Julius Braunnagel	250 South Laredo St., San Antonio, Tex.	1890
Dr. Carlos Brava	Colima, Mex.	1896
Dr. Charles W. Bray	Portland, Me.	1894
Dr. Sarah H. Brayton	Evanston, Ill.	1893
Dr. T. M. Brennan, Professor Laval University	Montreal, P. Q.	1894
Dr. Max Breuer	Virginia and Pearl Sts., Buffalo, N. Y.	1896
Dr. F. W. Brewer	Chicago, Ill.	1892
Prof. William H. Brewer	New Haven, Conn.	1874
Dr. Alexander B. Briggs, Member State Board of Health	Ashaway, R. I.	1895
Dr. A. H. Briggs	Hudson and West Ave., Buffalo, N. Y.	1896
John C. Brimblecom, Agent and Clerk Board of Health	West Newton, Mass.	1896
John M. Brinker, Coal and Iron Exchange	Buffalo, N. Y.	1896
Dr. Azarie Brodeur	707 Sherbrooke St., Montreal, P. Q.	1894
Dr. A. T. Brosseau, Professor de Clinique Externea l'Universite Laval	138 St. Denis St., Montreal, P.Q.	1894
Dr. A. H. Brown	7 William St., Auburn, N. Y.	1896
Dr. H. D. Brown	79 Market St., Potsdam, N. Y.	1896
Joseph O. Brown	Pittsburg, Pa.	1888
Dr. A. A. Browne	1002 Sherbrooke St., Montreal, P. Q.	1894
Dr. Gaius M. Brumbaugh	904 Mass. Ave., Washington, D. C.	1896
Dr. William Francis Brunner	50 Harris St., Savannah, Ga.	1890
Dr. Peter H. Bryce	Toronto, Ont.	1883
Dr. Erastus J. Buck	Platteville, Wis.	1888
Dr. John Robinson Buist	151 N. Spruce St., Nashville, Tenn.	1892
Dr. Frank Bullen, Professor of Ophthalmology, McGill University	111 Drummond St., Montreal, P. Q.	1894
Dr. Robert Burns, Health Officer	Plymouth, N. H.	1894
Dr. Charles Jenkins Burroughs	119 W. Church St., Jacksonville, Fla.	1892
Peter P. Burtis	Hodge Ave., Buffalo, N. Y.	1896
E. B. Byington, G. W. P. A., L. V. R. R.	Buffalo, N. Y.	1896
Dr. Jose Maria Calderon	Puebla, Puebla, Mex.	1892
Dr. Charles Caldwell, Registrar of Vital Statistics	3237 Ind. Ave., Chicago, Ill.	1893
Dr. Allan Cameron	Owen Sound, Ont.	1886

Dr. J. Chalmers Cameron, Professor of Obstetrics and Diseases of Infancy, McGill University . . . . . 941 Dorchester St., Montreal, P. Q. 1894

Dr. E. R. Campbell . . . . . Bellows Falls, Vt. 1894

Dr. Francis Wayland Campbell, Dean Faculty of Medicine, University of Bishop's College . . . . 10 Phillips Place, Montreal, P. Q. 1894

Dr. James Campbell, President Hartford Board of Health . . . . . Hartford, Conn. 1888

Dr. William Robertson Campbell, 34 Niagara St., Niagara Falls, N. Y. 1896

Dr. James Willis Candee, Health Commissioner . . 402 Warren St., Syracuse, N. Y. 1896

Dr. A. W. Cantwell . . . . . Davenport, Iowa. 1880

Dr. Luis S. Carmona . . . . . Mexico, Mex. 1896

Dr. Manuel Carmona y Valle . . . . . Mexico, Mex. 1892

Mr. C. Henri Carrier . . . . . Levis, P. Q. 1894

Dr. Edwin H. Carter, President Iowa State Board of Health . . . . . Des Moines, Iowa. 1896

Dr. Laurent Catellier . . . . . 31 Dauphine St., Quebec, P. Q. 1894

Dr. Charles S. Caverly, President of State Board of Health . . . . . Rutland, Vt. 1894

Dr. David Cerna . . . . . Galveston, Tex. 1896

Dr. Agustin Chacon . . . . . Ortega 10, Mexico, Mex. 1892

Dr. Eloi Philippe Chagnon, Physician to the Hospital for the Insane . . . . . Longue Pointe, P. Q. 1894

Prof. Stanford E. Chaillé . . . . . New Orleans, La. 1874

Prof. C. F. Chandler . . . . . 41 E. 49th St., New York City. 1872

David D. Chandler, Health Officer . 74 No. 7th St., Newark, N. J. 1896

Dr. Charles V. Chapin . . . . . Providence, R. I. 1886

Mr. John Henry Chapman . 2294 St. Catherine St., Montreal, P. Q. 1894

Dr. Joseph B. Charette, Medicin Municipal de Notre Dame des Neiges . . . . . Cote des Neiges, P. Q. 1894

Dr. Herman L. Chase, Health Officer . . . . . Brookline, Mass. 1895

John C. Chase, C. E. . . . . Derry, N. H. 1890

Dr. Tomas Chavez . . Leandro Valle 1, Guanajuato, Guanajuato, Mex. 1892

Dr. Jesus Chico . . 2 Estrella St., Guanajuato City, Guanajuato, Mex. 1891

Langdon T. Christian, Chairman Com. on Health, City Council . . . . . 1215 E. Broad St., Richmond, Va. 1893

Dr. Thomas Teasdale Church . . . . 70 E. Main St., Salem, Ohio. 1890

Dr. Jno. H. Cipperly, Health Officer . . 131 Second St., Troy, N. Y. 1896

Dr. C. D. Clark, Member State Board of Health . Minneapolis, Kan. 1895

Dr. Edward Clark . . . . . Franklin St., Buffalo, N. Y. 1896

Frank B. Clark . . . . . 333 Wabash Ave., Chicago, Ill. 1893

Dr. Gardner C. Clark . . . . . Niagara Falls, N. Y. 1896

Harry W. Clark, Experiment Station . . . . . Lawrence, Mass. 1896

Dr. Joseph C. Clark, Health Officer . 15 Lawreno St., Olean, N. Y. 1896

Dr. A. P. Clarke . . . . . Cambridge, Mass. 1887

Dr. L. J. V. Clerouse . . . . . 1105 Ontario St., Montreal, P. Q. 1894
Dr. E. F. X. Cleveland . . . . . Dundee, Ill. 1887
Dr. J. B. Coakley. . . . . 339 Delaware Ave., Buffalo, N. Y. 1896
James C. Coffey, Health Officer . . . . . Worcester, Mass. 1896
Dr. John W. Collins . . . . . Grand Junction, Col. 1895
Dr. C. S. Collins, Member State Board of Health . . Nashua, N. H. 1896
Mr. W. C. R. Colquhoun, Secretary Health Department
Wilmington, Del. 1894
Dr. G. P. Conn . . . . . Concord, N. H. 1875
Dr. P. S. Conner . . . . . Cincinnati, Ohio. 1884
Miss Emma O. Conro, Director Dept. Domestic Science,
Pratt Institute . . . . . Brooklyn, N. Y. 1893
Dr. Angel Contreras . . . . . Mesones 7, Puebla, Puebla, Mex. 1892
Dr. E. P. Cook . . . . . Mendota, Ill. 1895
Dr. Willis C. Cook, Health Officer . . King St., Brockport, N. Y. 1896
Dr. I. Cormier . . . . . Montreal, P. Q. 1894
Dr. Aaron Cornish . . . . 155 William St., New Bedford, Mass. 1892
William C. Cornwell, City Bank . . . . . Buffalo, N. Y. 1896
Dr. Richard W. Corwin . . . . . Pueblo, Col. 1895
Dr. George Edwin Coulthard, Secretary Provincial
Board of Health of New Brunswick, 18 Carleton St., Fredericton, N. B. 1894
Dr. C. W. Covernton . . . . . Toronto, Ont. 1884
Dr. John Coventry . . . . . Windsor, Ont. 1886
Dr. Edward Cowles, Superintendent of McLean Hos-
pital for the Insane . . . . . Somerville, Mass. 1894
Dr. G. G. Craig . . . . . Rock Island, Ill. 1880
Dr. Robert Craik, Dean of Medical Faculty of Mc-
Gill University . . . . . 887 Sherbrooke St., Montreal, P. Q. 1894
J. James R. Croes, C. E. . . . . 68 Broad St., New York City. 1877
Rev. Patrick Cronin, "Catholic Times" . . . . Buffalo, N. Y. 1896
Dr. Thomas D. Crothers, Superintendent Walnut
Lodge Hospital . . . . . Hartford, Conn. 1894
Dr. Henry Cooper Crouch, Bacteriologist Denver
Health Office, Barth Block . . . . . Denver, Col. 1895
Dr. A. W. Crow, City Physician and Sanitary Superin-
tendent . . . . . 1330 Grand Ave., Kansas City, Mo. 1893
Mr. Thomas P. Culloton, National Association of
Master Plumbers . . . . . 50 N. Clark St., Chicago, Ill. 1895
Dr. William M. Cummings, Health Officer, Bent County, Los Animos, Col. 1895
Dr. Charles Gilman Currier . . 75 West 55th St., New York City. 1893
Dr. David M. Currier . . . . . Newport, N. H. 1883
Dr. F. C. Curtis . . . . . Albany, N. Y. 1883
Dr. Charles O. Curtman . . . . . St. Louis, Mo. 1884
Dr. William Thomas Dalby . . . . . Salt Lake City, Utah. 1894
Dr. B. H. Daggett . . . . . Buffalo, N. Y. 1896
Dr. R. P. Daniell . . . . . Jacksonville, Fla. 1890
Hon. Charles Daniels . . . . . North St., Buffalo, N. Y. 1896

Dr. Hiram H. Darr . . . . . Caldwell, Tex. 1883
Dr. James Darrach . . . . . Germantown, Pa. 1874
Mr. Robert Davidson, Health Officer, 52 Market St., Sherbrooke, P. Q. 1894
Dr. John Chapman Davie, Chairman Provincial Board of Health . . . . . Victoria, B. C. 1896
Prof. Floyd Davis, Ph. D. . . . . Des Moines, Ia. 1890
Hon. George A. Davis . . . . . Ellicott Sq., Buffalo, N. Y. 1896
Dr. N. S. Davis . . . . . 291 Huron St., Chicago, Ill. 1887
Dr. John Harvey Davisson, Member California State Board of Health . . . . . 1442 Pleasant Ave., Los Angeles, Cal. 1893
Mark Alexander Dawes, V. S., Inspector of Milk and Dairies . . . . . 24 Stanley St., Montreal, P. Q. 1894
Dr. Howard Henderson Dawson, County Physician . . Rico, Col. 1895
Dr. Dwight W. Day . . . . . Eau Claire, Wis. 1888
Dr. Henry Day, Member State Board of Health of Wisconsin . . . . . Eau Claire, Wis. 1894
William H. Dean, E. M. A. C. 89 West River St., Wilkesbarre, Pa. 1896
Dr. James Osborne DeCourcy . . . . . St. Liborg, Ill. 1895
Dr. J. N. DeHart . . . . . Brooklyn, N. Y. 1896
Dr. Louis Avila Demero . . . . 139 Berri St., Montreal, P. Q. 1894
Dr. William Champion Deming, Medical Sanitary Inspector, New York City Board of Health . . West Chester, N. Y. 1895
Dr. Charles Denison . . . . . 1625 Logan Ave., Denver, Col. 1895
Dr. Laban Dennis . . . . . Newark, N. J. 1877
Dr. William P. Derby . . . . . 66 Beacon St., Boston, Mass. 1896
George W. Derrick . . . . . Buffalo, N. Y. 1896
Dr. Emil A. de Schweinitz, Chemist Bureau of Animal Industry . . . . . Washington, D. C. 1896
Dr. Jean Charles Prosper Frederic Despars, Medicin Officier de Sante . . 98 Mendon St., St. Hyacinthe, P. Q. 1894
Dr. Israel Joseph Desroches . 226 St. Dennis St., Montreal, P. Q. 1894
Dr. François H. De Vaux, Superintendent State Board of Health . . . . . Valley City, N. D. 1894
Dr. C. DeWitt . . . . . Fort Leavenworth, Kan. 1895
Charles E. Dickinson, Secretary Northern Finance Company . . . . . 1601 Logan Ave., Denver, Col. 1895
Dr. S. M. Dinsmore . . . . . Keene, N. H. 1896
Dr. Arah Dixon, Member State Board of Health . . Henderson, Ky. 1894
William E. Dodge, Jr. . . . . 11 Cliff St., New York City. 1874
Dr. Florence O. Donohoe . . . . . Syracuse, N. Y. 1891
Dr. L. Bradley Dorr, Jefferson St. . . . . Buffalo, N. Y. 1896
Alvah H. Doty, M. D., Port Health Officer, Rosebank, Staten Island, N. Y. 1896
Dr. C. W. Downing, President Board of Health . Manchester, N. H. 1896
Dr. James Edmund Downs, President United States Pension Board . . . . . 400 Main St., Aspen, Col. 1895
Dr. Gregory Doyle, Health Commissioner, 307 W. Genesee St., Syracuse, N. Y. 1896

Dr. F. W. Draper . . . . . 304 Marlborough St., Boston, Mass. 1887
Dr. Thomas M. Drown . . . . . South Bethlehem, Pa. 1887
Mr. William Drysdale, 952 Dorchester St. . . . Montreal, P. Q. 1894
Dr. Joseph Alfred Duchesneau . . . . . Terrebonne, P. Q. 1894
Dr. Charles B. Dudley . . . . . Altoona, Pa. 1888
Joseph P. Dudley . . . . . Buffalo, N. Y. 1896
Charles H. Dunbar . . . . . Buffalo, N. Y. 1896
Dr. S. A. Dunham . . . . . 180 Chippewa St., Buffalo, N. Y. 1896
Dr. Emmanuel E. Duquet, Medical Superintendent of Longue Pointe Asylum . . . . . Longue Pointe, P. Q. 1894
Dr. Samuel H. Durgin, 12 Beacon St. . . . . Boston, Mass. 1875
Dr. Henry A. Dykes, 600 Market St. . . . . Chattanooga, Tenn. 1895
Dr. Benjamin Franklin Eads . . . . . Marshall, Tex. 1892
Dr. James B. Eagleson, President State Board of Health, 512 Burke Building . . . . . Seattle, Wash. 1896
Dr. Wallace E. Edgerton . . . . . Salem, S. D. 1892
Dr. P. O'M. Edson . . . . . 249 Warren St., Boston, Mass. 1895
Dr. John Elsner . . . . . Denver, Col. 1887
Dr. Z. Taylor Emery, Commissioner of Health, 831 Washington Ave., Brooklyn, N. Y. 1894
Dr. Alfonso Ruis Erdozain . . . . . Hidalgo, Mex. 1896
Dr. James Buddington Erskine, Chairman Board of Health . . . . . Colebrook, N. H. 1894
Edwin T. Evans . . . . . North St., Buffalo, N. Y. 1896
Dr. James W. Exline, Professor of Hygiene and State Medicine, Gross Medical College . . . . . Denver, Col. 1895
Dr. George L. Eyster. . . . 1109 Second Ave., Rock Island, Ill. 1891
Frank L. Fales, C. E., Asst. Engineer Experiment Station, Massachusetts State Board of Health (Care Essex Co.) . . . . . Lawrence, Mass. 1893
Prof. Delos Fall . . . . . Albion, Mich. 1889
Dr. Edward Farnham . . . . . Cambridge, Mass. 1889
A. B. Farquar, Esq. . . . . York, Pa. 1880
C. M. Farrar . . . . . Perry St., Buffalo, N. Y. 1896
J. A. Fellows, G. P. A., W. N. Y. & P. R. R. . . Buffalo, N. Y. 1896
Byron Fenner . . . . . Westfield, N. Y. 1896
Dr. Henry Marshall Fenno . . 77 W. Main St., Rochester, N. Y. 1892
Dr. F. Ferguson . . . . . 20 W. 38th St., New York City. 1892
Dr. J. D. Fernandez . . . . . Jacksonville, Fla. 1890
George S. Field . . . . . Buffalo, N. Y. 1896
Dr. F. G. Finley, Professor in McGill University . . 803 Dorchester St., Montreal, P. Q. 1894
Dr. Samuel Augustus Fisk, Professor and Secretary Medical Department, University of Denver . . . . 37 Eighteenth Ave., Denver, Col. 1894
Gustav Fleischmann . . . Spring St. and Broadway, Buffalo, N. Y. 1896
Dr. Louis Fleischmann . . . . . 788 Broadway, New York City. 1890

Dr. ALEXANDER FLEMING . . . . . Brandon, Manitoba. 1896
RICHARD PHILIP FLEMING, C. E., Resident Engineer of the Montreal Sanitary Association 157 St. James St., Montreal, P. Q. 1894
Dr. LAWRENCE F. FLICK . . . . . 736 Pine St., Philadelphia, Pa. 1890
Dr. JAMES LESLIE FOLEY . . . . . 55 Union Ave., Montreal, P. Q. 1894
Dr. CHARLES JENKINS FOOTE, Bacteriologist . . . . 305 Howard Ave., New Haven, Conn. 1895
Dr. WILLIAM H. FORD . . . . 1622 Summer St., Philadelphia, Pa. 1874
NARCISSE FOREST, N. P. . . . . Ste. Scholastique, P. Q. 1894
LUCIEN FORGET . . . . . Montreal, P. Q. 1894
GEORGE V. FORMAN . . . Erie Co. Bank Building, Buffalo, N. Y. 1896
Dr. FELIX FORMENTO . . . . . New Orleans, La. 1880
Dr. EMILE RENE FORTIER . . . . 130 Ste. Anne St., Quebec, P. Q. 1894
Dr. LOUIS EDOUARD FORTIER . . . . . Montreal, P. Q. 1894
Dr. EUGENE FOSTER . . . . . Augusta, Ga. 1881
Dr. GEORGE S. FOSTER . . . . . Putney, Vt. 1893
PAUL G. FOURNIER, I. C. . . . . 97 St. Jacques St., Montreal, P. Q. 1894
Dr. AUGUSTE ACHILLE FOUCHER, Professor Laval University . . . . . 96 St. Denis St., Montreal, P. Q. 1894
Dr. JOSEPH FOWLER . . . . . 141 Delaware Ave., Buffalo, N. Y. 1896
B. P. FRASER, P. A., Penn. R. R. . . . . Buffalo, N. Y. 1896
Dr. C. C. FREDERICK . . . . . Richmond Ave., Buffalo, N. Y. 1896
Dr. SPENCER M. FREE . . . . . DuBois, Pa. 1885
HENRY C. FRENCH . . . . . Ellicott Square, Buffalo, N. Y. 1896
Dr. G. D. FROST, Member Board of Health . . . . Hanover, N. H. 1896
ROBERT L. FRYER . . . . . Ellicott Square, Buffalo, N. Y. 1896
GEORGE W. FULLER, Bacteriologist . 549 Third St., Louisville, Ky. 1893
Dr. W. H. GAIL . . . . . East Aurora, N. Y. 1896
Dr. ADRIAN DE GARAY . . . . . Mexico, Mex. 1892
Dr. A. PEDRO GARCIA . . . . . Jalapa, Vera Cruz, Mex. 1892
Dr. SALVADOR GARCIADIEGO . . . . . Guadalajara, Jalisco, Mex. 1892
Dr. JOHN H. GARDINER, Member of London Board of Health . . . . . London, Ont. 1894
Dr. WM. GARDNER, Professor of Gynecology, McGill University . . . . . 109 Union Ave., Montreal, P. Q. 1894
Dr. E. GARROTT . . . . . 751 Washington Boulevard, Chicago, Ill. 1893
Dr. JUAN F. DE LA GARZA . . . . . Laredo, Tamaulipas, Mex. 1896
Dr. FRANKLIN GAUNTT . . . . . Burlington, N. J. 1885
Dr. J. E. S. GAUTHIER, Gouverneur du College des Medicins . . . . . Upton, P. Q. 1894
Dr. LOUIS EDMOND GAUVREAU, Director Vaccine Institute . . . . . Quebec, P. Q. 1894
Dr. A. GAVIÑO . . . . . Ratas No. 4, Mexico, Mex. 1891
Dr. ADOLPH A. GEHRMANN, City Bacteriologist, 3816 Ellis St., Chicago, Ill. 1895
WILLIAM PAUL GERHARD, C. E. . . 36 Union Sq., New York City. 1880
Dr. JOHN GERIN, Health Commissioner 68 North St., Auburn, N. Y. 1896

Dr. Alexandre Germain . . . . . 453 Rachel St., Montreal, P. Q. 1894
Dr. Frederic H. Gerrish . . . . . Portland, Me. 1885
Prof. Wolcott Gibbs . . . . . Newport, R. I. 1876
Dr. W. T. Giddings . . . . . Gardiner, Me. 1894
Dr. A. Gifford . . . . . 917 Mass. Ave., Lawrence, Kan. 1895
Dr. Willis B. Gifford, Health Officer . . . . . Attica, N. Y. 1896
Dr. Albert L. Gihon, U. S. N. . 8 West 127th St., New York City. 1876
Dr. Wm. Joseph Gillespie . 1639 South Broad St., Philadelphia, Pa. 1894
Dr. Alfred C. Girard . . . . . Fort Niagara, N. Y. 1874
Dr. Gilbert Prout Girdwood, Professor of Chemistry, Medical Faculty, McGill University 82 University St., Montreal, P. Q. 1894
John C. Glenny . . . . . Main St., Buffalo, N. Y. 1896
Dr. John N. Goltra . . . . 441 Elmwood Ave., Buffalo, N. Y. 1896
Dr. Edward C. Goodrich . . 201, 202 Dyer Building, Augusta, Ga. 1892
Dr. R. S. Goodwin . . . . . Thomaston, Conn. 1886
Dr. J. Adelphi Gottleib, Professor Forensic Medicine 304 West 104th St., New York City. 1894
Dr. George G. Groff, Member Pennsylvania State Board of Health and Agriculture, Professor in Bucknell College . . . . . Union St., Lewisburgh, Pa. 1894
Dr. Franklin C. Gram, Health Department . . . . Buffalo, N. Y. 1896
W. H. Gratwick . . . . . Ellicott Square, Buffalo, N. Y. 1896
Dr. E. E. Graves . . . . . Boscawen, N. H. 1886
Mr. Crosby Gray . . . . . Pittsburgh, Pa. 1874
Henry R. Gray . . . . . 144 St. Lawrence Main, Montreal, P. Q. 1886
Samuel M. Gray, C. E. . . . 174 Weybosset St., Providence, R. I. 1891
Dr. James T. Greeley, President Board of Health . Nashua, N. H. 1896
Dr. Mary E. Greene . . . . . Lawrence Ave., Charlotte, Mich. 1896
Dr. Walter D. Greene . . . . . 385 Jersey St., Buffalo, N. Y. 1896
Joseph A. Grenier, I. C. . . 107 St. Jacques St., Montreal, P. Q. 1894
Dr. Edgerton Griffin, Medical Health Officer . . . 370 Colbune St., Brantford, Ont. 1886
Dr. John Griffin . . . . . 90 Sands St., Brooklyn, N. Y. 1888
P. Henry Griffin . . . . . North St., Buffalo, N. Y. 1896
Dr. Jefferson D. Griffith . . . . . Kansas City, Mo. 1891
Dr. Burton B. Grover, Health Officer . . Colorado Springs, Col. 1895
Dr. Edward A. Guilbert . . . . . Dubuque, Iowa. 1890
E. B. Guthrie, City Engineer . . . . . Buffalo, N. Y. 1896
Dr. Manuel Gutierrez . . . . . 13 Aduana Vieja, Mexico, Mex. 1891
Dr. Jacob Moyer Hagey . . . . . Mt. Morris, N. Y. 1892
Dr. J. M. Hall . . . . . Chicago, Ill. 1893
Dr. William R. Hall . . . . . 40 King St., Chatham, Ont. 1896
Dr. John B. Hamilton . . . . . 61 Market St., Chicago, Ill. 1886
Dr. J. H. Hamilton . . . . . Richford, Vt. 1891
C. J. Hamlin . . . . . Delaware Ave., Buffalo, N. Y. 1896
Dr. Joseph Warren Hancock, Member Wisconsin State Board of Health . . . . . Ellsworth, Wis. 1894

Dr. Lawrence G. Hanley . . . . . Seneca St., Buffalo, N. Y. 1896
D. W. Harrington . . . . . Cold Springs, Buffalo, N. Y. 1896
Mrs. Henry Harrington . . . . . 1080 Grant Ave., Denver, Col. 1895
Dr. George Wood Harrison, Member State Board of Health . . . . . 404 Second St., Ashland, Wis. 1896
Dr. James A. Hart . . 802 N. Nevada Ave., Colorado Springs, Col. 1895
Maj. Philip Francis Harvey, Surgeon U. S. A., Plattsburgh Barracks . . . . . Plattsburgh, N. Y. 1894
Josiah Hartzell, Ph. D., Member State Board of Health . . . . . Canton, Ohio. 1895
Dr. W. A. Haskell . . . . . Alton, Ill. 1883
A. G. Hauenstein . . . . . Ellicott Square, Buffalo, N. Y. 1896
Edmund Hayes . . . . . North St., Buffalo, N. Y. 1896
Dr. George Stevens Hazard, Health Officer . . . . Hollis, N. H. 1896
Allen Hazen, C. E. . . . . 85 Water St., Boston, Mass. 1892
Dr. W. H. Heath . . . . Franklin and Court Sts., Buffalo, N. Y. 1896
A. E. Hedstrom . . . . . Buffalo, N. Y. 1896
R. R. Hefford . . . . . Merchants' Exchange, Buffalo, N. Y. 1896
Dr. John Lorenzo Heffron, Professor Therapeutics and Clinical Medicine, Syracuse University, College of Medicine . . . . . 448 South Salina St., Syracuse, N. Y. 1894
William Hengerer . . . . . Buffalo, N. Y. 1896
Mr. Charles P. Herbert . . Champ de Mars St., Montreal, P. Q. 1894
Rudolph Hering, C. E. . . . . 277 Pearl St., New York City. 1878
Dr. J. H. Heron . . . . . Salt Lake City, Utah. 1895
Dr. Edgar P. Hershey, . . . 408 California Building, Denver, Col. 1895
Dr. Charles N. Hewett . . . . . Red Wing, Minn. 1872
Dr. James F. Hibberd . . . . . Richmond, Ind. 1881
Hibbert Hill . . . . . 441 Sackville St., Toronto, Ont. 1896
John W. Hill, C. E. . . . . 35 Glenn Building, Cincinnati, Ohio. 1896
Dr. W. H. Hingston, Professor of Clinical Surgery . Montreal, P. Q. 1894
Dr. F. Whitehill Hinkel . . . . Delaware Ave., Buffalo, N. Y. 1896
Dr. Frank E. Hitchcock . . . . . 22 White St., Rockland, Me. 1892
Dr. Carleton E. Hoadley, Health Officer . . . . 116 Church St., New Haven, Conn. 1896
Dr. Cornelius N. Hoagland . . 710 Clinton Ave., Brooklyn, N. Y. 1887
Dr. Charles A. Hodgetts, Member Executive Health Officers' Association of Ontario . . 8 St. Patrick St., Toronto, Ont. 1894
Dr. Charles Henry Holcombe . . . . . Brookline, N. H. 1894
Dr. Erastus Eugene Holt, Executive and Senior Attending Surgeon of Maine Eye and Ear Infirmary, . 723 Congress St., Portland, Me. 1894
Dr. Henry D. Holton . . . . . Brattleboro, Vt. 1875
Dr. George Homan . . . . . 919 Olive St., St. Louis, Mo. 1879
Dr. William G. Hoopes, President Board of Health Atlantic City, N. J. 1896
Dr. H. B. Horlbeck . . . . . Charleston, S. C. 1880
Dr. Elizabeth S. Horr . . . . . 114 Pine St., Lewiston, Me. 1894

George R. Howard . . . . . Buffalo, N. Y. 1896
Dr. Lucien Howe . . . . . 183 Delaware Ave., Buffalo, N. Y. 1896
Dr. Henry F. Hoyt . . . . . St. Paul, Minn. 1884
Dr. J. Elizabeth Hoyt . . . 85 North State St., Concord, N. H. 1895
Dr. A. A. Hubbell . . . . . Franklin St., Buffalo, N. Y. 1896
Dr. William H. Huger . . . . . Charleston, S. C. 1890
William Q. Huggins, Health Officer . . . . . Sanborn, N. Y. 1896
Mr. J. W. Hughes, Master Plumber . 747 Craig St., Montreal, P. Q. 1894
Joseph Hunsicker, Ellicott Club . . . . . Buffalo, N. Y. 1896
Dr. A. Clark Hunt . . . . . Metuchen, N. J. 1888
Dr. C. C. Hunt . . . . . Dixon, Ill. 1889
Dr. Simeon Hunt . . Warren Ave. and 2d St., E. Providence, R. I. 1896
Charles R. Huntley . . . . . General Electric Co., Buffalo, N. Y. 1896
Harvey J. Hurd . . . . . Ellicott Sq., Buffalo, N. Y. 1896
Dr. H. M. Hurd . . . . . Baltimore, Md. 1883
Dr. John N. Hurty, Secretary State Board of Health .
29 East Second St., Indianapolis, Ind. 1896
Dr. J. Alex Hutchison, Chief Medical Officer, G. T. R.
70 Mackay St., Montreal, P. Q. 1894
Jno. B. Hutchinson . . . . . 187 St. James St., Quebec, P. Q. 1894
Dr. Theophilus V. Hutchinson, City Health Officer . . London, Ont. 1896
Dr. Maxell S. Inglis, Health Officer . . . . Winnipeg, Manitoba. 1894
Dr. Mary de Booy Ingram . . 196 Joralemon St., Brooklyn, N. Y. 1896
Lawrence Irwell, M. A., B. C. L. 76 W. Tupper St., Buffalo, N. Y. 1896
Col. Bernard J. D. Irwin, M. D., U. S. A. . . . .
Care War Department, Washington, D. C. 1893
Dr. Edward Jackson . . . . . McPhee Building, Denver, Col. 1895
Dr. Frank S. Jackson . . . . . Dunkirk, N. Y. 1896
Dr. William H. Jackson, Health Officer 38 Main St., Springville, N. Y. 1896
Dr. Bushrod W. James . Cor. 18th and Green Sts., Philadelphia, Pa. 1878
F. H. James . . . . . Board of Trade, Buffalo, N. Y. 1896
Dr. John H. James . . . . . Elkton, Md. 1895
Dr. William T. Jenkins . . . . . Quarantine, Staten Island, N. Y. 1892
Dr. James W. Jenney . . . . . Salina, Kan. 1891
Hon. Edgar B. Jewett, Mayor . . . . . Buffalo, N. Y. 1896
Dr. Jesus Jimenez, Physician and Surgeon . . . .
Calle de Palacio 23½, Guadalajara, Mex. 1893
Dr. Sam C. Johnson . . . . . Hudson, Wis. 1883
Dr. Wyatt Johnson . . . . . St. James Club, Montreal, P. Q. 1892
Dr. Charles Sumner Jones . . . . Delaware Ave., Buffalo, N. Y. 1896
Dr. D. C. Jones . . . . . Topeka, Kan. 1887
Dr. Leander P. Jones . . . . . Greenwich, Conn. 1889
Dr. S. Case Jones, New York State Commissioner of
Health . . . . . 21 East Ave., Rochester, N. Y. 1895
Dr. S. J. Jones . . . . . Chicago, Ill. 1893
Edward C. Jordan, C. E. . . . . Portland, Me. 1886
Dr. R. D. Kahle, Member State Board of Health . . . . Lima, O. 1893

Dr. Lee Kahn, City Physician . . 501 Harrison Ave., Leadville, Col. 1894
Dr. Sol G. Kahn . . . . . Leadville, Col, 1895
Hon. J. M. Keating . . . . . Memphis, Tenn. 1880
C. H. Keefer, C. E. . . . . Ottawa, Ont. 1896
Dr. Wilhelm H. Keller, Health Officer . . . . Stony Point, N. Y. 1896
Dr. J. H. Kellogg . . . . . Battle Creek, Mich. 1878
Dr. J. F. Kennedy . . . . . Des Moines, Iowa. 1885
Dr. John T. Kennedy, Physician and Surgeon . . .
107 East 29th St., New York City. 1893
Dr. G. M. Kimball . . . . . Concord, N. H. 1886
Dr. James P. Kimball, U. S. A. . . . . Governor's Island, N. Y. 1892
Dr. Byron F. Kingsley . . Cor. Elm and Starr, San Antonio, Tex. 1892
Dr. J. J. Kinyoun, U. S. M. H. S. . . . . Washington, D. C. 1895
Dr. Robert Charles Kirkpatrick, Demonstrator of Surgery, McGill University, Surgeon to Montreal General Hospital . . . . . 163 Mansfield St., Montreal, P. Q. 1894
Dr. Thomas Kirkpatrick, Secretary State Board of Health . . . . . 821 Kansas Ave., Topeka, Kan. 1895
Dr. S. P. B. Knox, A. M. . . . 912 Anacapa, Santa Barbara, Cal. 1892
Dr. William F. Knox . . . . . McKeesport, Pa. 1887
Dr. George M. Kober . . . . . 1718 Q St., Washington, D. C. 1896
Dr. Cornelius Kollock . . . . . Cheraw, S. C. 1884
Emil Kuichling, C. E. . . . . Rochester, N. Y. 1882
Dr. Emmanuel P. Lachapelle, ... Montreal, P. Q. 1887
Dr. Severin Lachapelle, Professor Laval University .
2606 Notre Dame St., Montreal, P. Q. 1894
Dr. J. R. Laine, Secretary State Board of Health . .
913 K St., Sacramento, Cal. 1895
Dr. Jean Baptiste Lamarche, Professor of Obstetrics, Laval University . . . . . 342 Craig St., Montreal, P. Q. 1894
Dr. Joseph Lancetol . . . . . St. Henri St., Montreal, P. Q. 1894
Dr. Francois Joseph Langlais, Officer de Sante Trois-Pistoles, P. Q. 1894
Dr. Joseph E. A. Lanouette . . 1034 Elm St., Manchester, N. H. 1894
Dr. Joseph Edouard Laberge . 429 St. Hubert St., Montreal, P. Q. 1894
Dr. Louis Laberge . . . . . Montreal, P. Q. 1886
Dr. S. W. Latta . . . . . Trenton, N. J. 1885
George E. Laverack . . . . . Washington St., Buffalo, N. Y. 1896
Prof. James Law . . . . . Ithaca, N. Y. 1872
Dr. J. W. Lawrence . . . . . Winnipeg, Manitoba. 1895
Dr. Reginald Barkley Leach, Secretary Board of Health . Paris, Tex. 1894
Dr. M. M. Leahy . . . . . 6648 Wentworth Ave., Chicago, Ill. 1892
Dr. John Lainy Leal . . . . . 149 Ellison St., Paterson, N. J. 1891
Dr. John B. Learned . . . . . Florence, Mass. 1889
Dr. Benjamin Lee . . . . . 1522 Pine St., Philadelphia, Pa. 1874
Dr. Albert Leffingwell, Physician and Surgeon . . Summit, N. J. 1893
L. Z. Leiter, Esq., ... P. O. Drawer L, Chicago, Ill. 1876
William T. Lemp . . . . . St. Louis, Mo. 1884

Dr. ROBERT LEROY . . . . . Denver, Col. 1895
JOSEPH LESSARD, President of the Board of Inspectors of Industrial Establishments and Public Buildings . . 259 St. Hubert St., Montreal, P. Q. 1894
OGDEN P. LETCHWORTH . . . . . Buffalo, N. Y. 1896
Hon. WILLIAM P. LETHWORTH . . . . . Glen Iris, Portageville, N. Y. 1874
Dr. DANIEL LEWIS . . . . . 249 Madison Ave., New York City. 1894
Dr. F. PARK LEWIS . . . . . Franklin St., Buffalo, N. Y. 1896
Dr. FRANCIS W. LEWIS . . . . 2016 Spruce St., Philadelphia, Pa. 1874
GEORGE A. LEWIS . . . . . Lewis Block, Buffalo, N. Y. 1896
G. E. ROSS-LEWIS, Cashier First National Bank . . . 1912 Logan Ave., Denver, Col. 1895
GEORGE L. LEWIS . . . . . Buffalo, N. Y. 1896
Dr. RICHARD H. LEWIS . . . . . Raleigh, N. C. 1892
Dr. EDUARDO LICÉAGA . . . . . 4 San Andres St., Mexico, Mex. 1891
Dr. CHARLES A. LINDSLEY . . . . . New Haven, Conn. 1875
Dr. J. BERRIEN LINDSLEY . . . . . Nashville, Tenn. 1877
H. H. LITTELL . . . . . Buffalo, N. Y. 1896
Dr. RAFAEL LOAIZA . . . . . Tlaxcala, Mex. 1896
FRANKLIN D. LOCKE . . . . . Erie St., Buffalo, N. Y. 1896
GEORGE L. LOCKE, D. D. . . . . Bristol, R. I. 1894
Dr. A. L. LOCKHART, Assistant Gynecologist to the Montreal General Hospital . . . . 59 Metcalfe St., Montreal, P. Q. 1894
Capt. OSCAR F. LONG, U. S. Army . . . . . Care of War Department, Washington, D. C. 1892
Dr. TOMAS LOREK . . . . . Zacatecas, Mex. 1895
Dr. THOMAS LOTHROP . . . . . Delaware Ave., Buffalo, N. Y. 1896
Dr. JULIA ROSS LOW . . . . . Chicago, Ill. 1893
Dr. W. J. LUMSDEN . . . . . Elizabeth City, N. C. 1892
Dr. JOHN D. MACDONALD, Chairman Provincial Board of Health . . . . . 28 Duke St., Hamilton, Ont. 1894
Mr. JOHN J. MACKENZIE, B. A., Analyst Provincial Board of Health . . . . . Parliament Building, Toronto, Ont. 1894
Dr. J. M. MACKIE . . . . . Portage La Prairie, Manitoba. 1896
Dr. ANDREW MACPHAIL, Professor of Pathology, University of Bishop's College . 2430 St. Catherine St., Montreal, P. Q. 1894
Dr. WILLIAM T. MAHON . . . . . Chamois, Mo. 1893
FRANK MAISCHOSS . . . . . Chicago St., Buffalo, N. Y. 1896
Mr. ERIC MANN, Architect . . . . 30 St. John St., Montreal, P. Q. 1894
GEORGE E. MANN . . . . . Buffalo, N. Y. 1896
Dr. M. D. MANN . . . . . Allen St., Buffalo, N. Y. 1896
Mr. S. W. MANNING . . . . 332 Washington St., Boston, Mass. 1892
WILLIAM L. MARCY . . . Erie Co. Bank Building, Buffalo, N. Y. 1896
Dr. FRANCISCO MARIN . . . . . Puebla, Puebla, Mex. 1891
Dr. SOLON MARKS . . . . . Milwaukee, Wis. 1876
Dr. C. H. MARQUARDT, Physician and Surgeon, Member State Board of Health . . . . . La Crosse, Wis. 1893

Dr. MIGUEL MARQUEZ . . . . . Chihuahua, Chihuahua, Mex. 1892
Dr. E. J. MARSH . . . . . Paterson, N. J. 1872
Dr. JAMES P. MARSH . . . . . 1739 5th Ave., Troy, N. Y. 1896
Dr. W. Q. MARSH, Surgeon Mexican Northern R. R., Sierra Mojada, Coahuila, Mex. 1893
CHARLES D. MARSHALL . . . Erie Co. Savings Bank, Buffalo, N. Y. 1896
Dr. THOMAS MASSON . . . . . Cape Vincent, N. Y. 1896
GEORGE B. MATHEWS . . . . Merchants' Exchange, Buffalo, N. Y. 1896
Dr. J. M. MATHEWS, President State Board of Health, 923 4th St., Louisville, Ky. 1895
GEORGE E. MATTHEWS . . . . . Express, Buffalo, N. Y. 1896
Dr. W. A. MATSON, Physician to Montreal General Hospital . . . . . 61 Union Ave., Montreal, P. Q. 1894
Dr. EZRA S. MCCLELLAN . . . . . Saranac Lake, N. Y. 1889
Dr. J. H. MCCLELLAND . . . . . Pittsburg, Pa. 1885
Dr. J. N. MCCORMACK . . . . . Bowling Green, Ky. 1880
Dr. MILTON MCCRIMMON, Medical Health Officer, Township of Tratolga . . . . . Palermo, Ont. 1894
Dr. CHAMPE CARTER MCCULLOCK, C. E., First Lieutenant, Medical Department, U. S. A. . . . . Fort Ringgold, Tex. 1894
J. D. MCDONALD, C. P. A., Grand Trunk R. R. . . Buffalo, N. Y. 1896
ALAN MCDOUGALL, C. E. . . . . Toronto, Ont. 1886
FRANK S. MCGRAW . . . . . Buffalo, N. Y. 1896
Dr. GEORGE WILBUR MCGREGOR . . . . . Littleton, N. H. 1894
Dr. PETER J. MCHUGH, Health Physician . . . . Fort Collins, Col. 1895
THOS. H. MCKENZIE, C. E., Member State Board of Health . . . . . Southington, Conn. 1893
Hon. D. H. MCMILLAN . . . . . Ellicott Sq., Buffalo, N. Y. 1896
Dr. J. HENRY MCNEIL . . . . 33 Sheboygan St., Fond du Lac, Wis. 1896
Dr. JAMES FRANCIS MCSHANE, 2 So. Patterson Park Ave., Baltimore, Md. 1892
JOHN J. MCWILLIAMS . . . Erie Co. Bank Building, Buffalo, N. Y. 1896
DANIEL WEBSTER MEAD, C. E. . . . Brown Building, Rockford, Ill. 1892
Dr. JULIAN AUGUSTUS MEAD, Member Mass. State Board of Health . . . . . Irving St., Watertown, Mass. 1896
Dr. C. F. MENNINGER, Member State Board of Health, Topeka, Kan. 1895
Dr. ALFRED MERCER . . . . . Syracuse, N. Y. 1886
Dr. OSCAR F. MERCIER, Surgeon Notre Dame Hospital 144 St. Denis St., Montreal, P. Q. 1894
Dr. ALBERT MERRELL . . . 3814 Washington Ave., St. Louis, Mo. 1891
Dr. ABRAHAM LOUIS METZ, Demonstrator of Chemistry Medical Department, Tulane University . . . . New Orleans, La. 1894
ISADORE MICHAEL . . . . . Mooney Building, Buffalo, N. Y. 1896
ANDRE MICHAUD, I. C. . . . 99 St. Jacques St., Montreal, P. Q. 1894
JOHN G. MILBURN . . . . . Ellicott Sq., Buffalo, N. Y. 1896
CHARLES W. MILLER . . . . Main and Eagle Sts., Buffalo, N. Y. 1896
EDWIN S. S. MILLER . . . . Main and Tupper Sts., Buffalo, N. Y. 1896
GEORGE W. MILLER . . . . . Delaware Ave., Buffalo, N. Y. 1896

Dr. KATHARINE MILLER . . . . . 513 Broadway, Lincoln, Ill. 1892
Dr. HENRY MITCHELL . . . . . Asbury Park, N. J. 1886
Mr. JOHN MITCHELL, President National Association Master Plumbers of the United States, 113 Hudson St., New York City. 1894
Dr. WILLIAM FRANCIS MITCHELL . . . . . Lancaster, Mo. 1892
Dr. JESÚS E. MONJARÁS, Cinco de Mayo . . . San Luis Potosí, Mex. 1891
C. MONJEAU, C. E. . . . . Middleton, Ohio. 1887
Dr. JOHN MONTGOMERY, State Superintendent of Public Health . . . . . Ardoch, N. D. 1895
Dr. L. H. MONTGOMERY . . . . . 70 State St., Chicago, Ill. 1879
Dr. FREDERICK MONTIZAMBERT . . . . Grosse Isle, Quebec, P. Q. 1885
F. J. MOORE, General Agent N. Y., C. & St. L. R. R., Buffalo, N. Y. 1896
Dr. VERAMUS A. MOORE, Prof. Cornell University . . . Ithaca, N. Y. 1896
Hon. ADELBERT MOOT . . . . . Buffalo, N. Y. 1896
Dr. JOSE DONACIANO MORALES, Hospicio San Nicholes 13, Mexico, Mex. 1892
DAVID PERCY MORGAN . . . . 1705 Locust St., Philadelphia, Pa. 1885
Dr. JOHN MORRIS . . . . . 118 E. Franklin St., Baltimore, Md. 1874
Dr. MOREAU MORRIS . . . . . 109 E. 73d St., New York City. 1896
Dr. CHARLES A. MORSE . . . . . Newmarket, N. H. 1894
WILLIAM F. MORSE, S. E. . . . . 58 Pine St., New York City. 1889
Dr. ELIZA M. MOSHER . . . . . Ann Arbor, Mich. 1889
Dr. WILLIS B. MOULTON, Professor of Ophthalmology, Bowdoin College . . . . . 180 State St., Portland, Me. 1894
Dr. JOHN WM. MOUNT . . . . 746 Notre Dame St., Montreal, P. Q. 1894
HENRY K. MULFORD . . . . . 412 So. 13th St., Philadelphia, Pa. 1896
Dr. ALEXANDER J. MULLEN, JR., 409 Washington St., Michigan City, Ind. 1892
Dr. WILLIAM P. MUNN, Health Commissioner, 709 Fourteenth St., Denver, Col. 1895
HOWARD MURPHY, Civil and Sanitary Engineer, Member State Board of Health . . . . 326 Walnut St., Philadelphia, Pa. 1893
Dr. ROBERT D. MURRAY, U. S. M. H. S. . . . . Key West, Fla. 1872
Dr. HERMAN MYNTER . . . . . 566 Delaware Ave., Buffalo, N. Y. 1896
JOHN G. NAGEL . . . . . Main St., Buffalo, N. Y. 1896
Dr. JOHN T. NAGLE . . . . . 47 East 21st St., New York City. 1874
Dr. A. NASH . . . . . Joliet, Ill. 1887
Dr. HERBERT M. NASH . . . . . Norfolk, Va. 1878
EDWARD T. NELSON, President of Ohio State Board of Health . . . . . Delaware, Ohio. 1894
Dr. WOLFRED NELSON . . . . . Astor House, New York City. 1893
Dr. S. A. NICHOLS . . . . . 230 Brady St., Davenport, Ia. 1895
Dr. ALBERTO NORIEGA . . . . . Hermosillo, Sonora, Mex. 1891
Dr. TOMAS NORIEGA . . . . . Hospital de Jesus, Mexico, Mex. 1892
WILLIAM P. NORTHRUP, Washington and Exchange Sts., Buffalo, N. Y. 1896
ALBERT F. NOYES, C. E. . . . . 85 Water St., Boston, Mass. 1896
Dr. R. J. NUNN . . . . . 114½ York St., Savannah, Ga. 1881
Dr. GEORGE H. F. NUTTALL, Allonaerstrasse 7th, Berlin, N. W., Germany. 1891

Dr. Charles Wilbur Nutting, Member State Board of Health . . . . . Etna, Cal. 1893
Dr. E. C. W. O'Brien . . . . . Delaware Ave., Buffalo, N. Y. 1896
Dr. J. H. O'Donnell, Chairman Provincial Board of Health . . . . . Winnipeg, Manitoba. 1893
Dr. William Oldright . . . . . Toronto, Ont. 1883
Dr. Samuel Rutherford Olliphant, 111 Prytania St., New Orleans, La. 1892
Dr. William T. Oppenheimer, Health Officer . . . Richmond, Va. 1893
Dr. H. S. Orme . . . . . Los Angeles, Cal. 1885
Dr. John G. Orton . . . . . Binghamton, N. Y. 1890
Dr. Domingo Orvañanos . . . . 25 Chaviarra St., Mexico, Mex. 1890
Dr. Edward Osgood Otis . . . 93 Mt. Vernon St., Boston, Mass. 1894
Dr. Frank K. Paddock . . . . . Pittsfield, Mass. 1889
Mr. Louis Gustave Papineau, C. E., Resident Engineer Lachine Drainage System . . . 369 St. Denis St., Montreal, P. Q. 1894
Dr. Paul Paquin, D. V. S. . . . . 3536 Olive St., St. Louis, Mo. 1891
Dr. Roswell Park . . . . . Delaware Ave., Buffalo, N. Y. 1896
Dr. John Parmenter . . . . . Franklin St., Buffalo, N. Y. 1896
H. Parry, C. T. A., N. Y. C. & W. S. R. R. . . . Buffalo, N. Y. 1896
Dr. James Patterson, Chairman Provincial Board of Health . . . . . 277 Donald St., Winnipeg, Manitoba. 1894
Dr. George Farrar Patton, Secretary State Board of Health . . . . . 1134 Camp St., New Orleans, La. 1896
W. H. Peabody . . . . . Main St., Buffalo, N. Y. 1896
Dr. George Peck, U. S. Navy . 926 No. Broad St., Elizabeth, N. J. 1890
Dr. Elzéar Pelletier . . . . . Montreal, P. Q. 1892
Henry E. Pellew, Esq. . . . . Katonah, N. Y. 1876
Mr. Maurice Perrault . . . . 97 St. Jacques St., Montreal, P. Q. 1894
Dr. Thomas B. Perry, P. A. Surgeon, U. S. M. H. S., 414 Delaware Ave., Buffalo, N. Y. 1896
Dr. John A. Pettit, Health Officer . . 519 Swan St., Buffalo, N. Y. 1896
Dr. William C. Phelps . . . . . 146 Allen St., Buffalo, N. Y. 1896
Dr. Philippe Picard . . . . . Fraserville, P. Q. 1894
R. V. Pierce . . . . . 663 Main St., Buffalo, N. Y. 1896
Dr. Robert L. Pitfield . 5450 Germantown Ave., Philadelphia, Pa. 1896
Mrs. Harriette M. Plunkett, President House of Mercy Hospital . . . . . 156 East St., Pittsfield, Mass. 1893
Dr. J. D. Plunket . . . . . Nashville, Tenn. 1878
Dr. J. D. Poindexter, U. S. A. . . . . Fort Riley, Kan. 1896
Dr. Joseph Y. Porter, U. S. A. . . . . Key West, Fla. 1878
Mr. Henry Powles . . . . . Broad St., Newark, N. J. 1894
Mr. Pascal P. Pratt . . . . . 736 Main St., Buffalo, N. Y. 1896
Dr. Susan Remsen Pray . . . 191 So. Ninth St., Brooklyn, N. Y. 1896
Dr. Maurice Pritchard, Health Officer, President Board of Health . . . . . Sierra Valley, Cal. 1893
Dr. C. O. Probst . . . . . Columbus, O. 1886
Dr. Helen C. Putnam . . . . . 24 Greene St., Providence, R. I. 1894

Mr. Perley Putnam . . . . . Laconia, N. H. 1892
Dr. Taylor E. Raines, President State Board of Health . . . . . Concordia, Kan. 1895
Dr. José Ramirez . . . . Plazuela Buena Vista 1626, Mexico, Mex. 1892
Dr. Douglas C. Ramsay . . . . . Mount Vernon, Ind. 1894
Frank Bert Rasbach . . . . . 172 Allen St., Buffalo, N. Y. 1896
Dr. William C. Ravenel . . . . . Charleston, S. C. 1890
Dr. Allen A. Rawson . . . . . Corning, Ia. 1892
Dr. Joseph H. Raymond . . . 173 Joralemon St., Brooklyn, N. Y. 1882
Dr. J. R. Raymond, Inspecteur de Lait, 751 Cadieux St., Montreal, P. Q. 1894
Dr. Thomas D. Reed, Lecturer in Hygiene at McGill Normal School . . . . . 91 University St., Montreal, P. Q. 1894
Dr. J. T. Reeve . . . . . Appleton, Wis. 1876
Dr. Alex P. Reid, Secretary Provincial Board of Health for Nova Scotia . . . . . Halifax, N. S. 1894
Dr. Edward A. Reiley . . . . . 312 Baldwin St., Elmira, N. Y. 1890
Dr. Edward O. Reilly, Member State Board of Health, Elizabeth, N. J. 1893
F. W. Reilly . . . . . Room 2, City Hall, Chicago, Ill. 1896
Ottomar Reinecke . . . . . Buffalo, N. Y. 1896
Dr. Augustin Reyes . . . . . Mexico, Mex. 1892
Dr. A. R. Reynolds, Commissioner of Health . . . . Chicago, Ill. 1893
Dr. Arthur Ricard, Physician at Notre Dame Hospital, ... 146 St. Dennis St., Montreal, P. Q. 1894
Edgar Richards . . . . . 1621 H St., Washington, D. C. 1889
Mrs. E. H. Richards, Institute Technology . . . . Boston, Mass. 1888
Dr. Abel Parker Richardson . . . . . Walpole, N. H. 1894
Maj. Henry B. Richardson, C. E. . . . . New Orleans, La. 1880
Dr. W. L. Richardson . . 225 Commonwealth Ave., Boston, Mass. 1875
Henry A. Richmond . . . Delaware and Tupper Sts., Buffalo, N. Y. 1896
J. M. Richmond . . . . . 23 Franklin St., Buffalo, N. Y. 1896
Dr. George Riddle, Member Provincial Board of Health . . . . . Crystal City, Manitoba. 1895
Dr. William C. Rives . . . . 22 West 33d St., New York City. 1885
Dr. Charles F. Roberts . . . . . 69 E. 54th St., New York City. 1892
Hon. James A. Roberts . . . . . Mooney Building, Buffalo, N. Y. 1896
Dr. John B. Roberts . . . . . 1627 Walnut St., Philadelphia, Pa. 1886
Dr. Adolphe Robillard, City Health Officer, City Hall, Ottawa, Ont. 1896
Dr. A. C. Robinson, Member of Board of Health . . 3402 Pine St., St. Louis, Mo. 1894
Dr. DeLorme W. Robinson, President of State Board of Health of South Dakota . . . . . Pierre St., Pierre, So. Dak. 1894
Prof. Franklin C. Robinson . . . . . Brunswick, Me. 1889
Dr. John Franklin Robinson . . . . . Manchester, N. H. 1894
Dr. Thomas George Roddick, Professor of Surgery, McGill University . . . . . 80 Union Ave., Montreal, P. Q. 1894
Dr. Francis J. Rogers . . . . . Stamford, Conn. 1889
Hon. Sherman S. Rogers . . . . . Erie St., Buffalo, N. Y. 1896

Dr. GEORGE H. ROHÉ . . . . . Skyesville, Md. 1880
Dr. ELIZA H. ROOT, Prof. Hygiene and Medical Jurisprudence, Woman's Medical School, Northwestern University . . . . . Chicago, Ill. 1893
Dr. JEAN PHILIPPE ROTTOT, Dean Medical Faculty, Laval University . . . . . Montreal, P. Q. 1894
Dr. L. J. HERCULE ROY, Compilateur des Statistiques au Council Provincial d' Hygiene . 76 St. Gabriel St., Montreal, P. Q. 1894
Dr. CARL RUEDI . . . . . 1711 Grant Ave., Denver, Col. 1895
J. RUMP, C. E. . . . . Copenhagen, Denmark. 1893
DEXTER P. RUMSEY . . Delaware Ave. and Tracy St., Buffalo, N. Y. 1896
Dr. JULIA WALLACE–RUSSELL . . . 44 Pleasant St., Concord, N. H. 1892
Dr. R. F. RUTTAN, Lecturer on Hygiene, McGill University . . . . . Montreal, P. Q. 1893
Dr. WALLACE EDGAR SABIN, Health Officer . . . . 1756 Fifteenth St., Highlands, Col. 1895
Dr. P. D. ST. JOHN, Member State Board of Health . Wichita, Kan. 1895
Dr. E. M. SALA . . . . . 1807 5th Ave., Rock Island, Ill. 1896
D. E. SALMON, D. V. M. . . . . Washington, D. C. 1883
Dr. JOSÉ A. SAMANIEGO . . . . Ciudad Juarez, Chihuahua, Mex. 1892
Dr. FRANCISCO SANCHEZ . . . . . Puebla, Puebla, Mex. 1892
Prof. LEONARD J. SANFORD . . . . . New Haven, Conn. 1885
CHARLES R. SANGER, Prof. of Chemistry . . . . Washington University, St. Louis, Mo. 1893
Dr. CARLOS SANTA-MARIA . . . . . Durango, Mex. 1896
AUGUST SCHNEIDER, Health Department . . . . . Buffalo, N. Y. 1896
Dr. W. L. SCHENCK . . . . . Topeka, Kan. 1891
Dr. HENRY ERNEST SCHMID, President Board of Health, White Plains, N.Y. 1896
Hon. ARTHUR SCHOELLKOPF . . Merchant's Exchange, Buffalo, N. Y. 1896
Dr. WARREN SCHOONOVER, House Physician, and Secretary Northeastern Dispensary . 115 East 59th St., New York City. 1895
Dr. JOHN JOSEPH SCOTT . . . . 314 Common St., Shreveport, La. 1894
Dr. HENRY S. SCULL, Secretary Board of Health . . Atlantic City, N. J. 1896
Dr. JOHN H. SEARS . . . . . Waco, Tex. 1887
Dr. HENRY SEWALL, Secretary State Board of Health, 23 Eighteenth Ave., Denver, Col. 1894
Dr. JOSEPH SHARP . . . . . 1027 Cherry St., Kansas City, Mo. 1891
Dr. CHARLES SHEARD, Medical Health Officer, 314 Jarvis St., Toronto, Ont. 1894
Dr. W. L. SHENK . . . . . New Castle, Col. 1895
Dr. FRANCIS J. SHEPHERD, Professor of Anatomy . . 152 Mansfield St., Montreal, P. Q. 1894
Dr. GEORGE R. SHEPHERD . . . 667 Asylum St., Hartford, Conn. 1886
Dr. CHARLES SHIARD . . . . . Toronto, Ont. 1896
Dr. G. M. SHILLITO . . . . . Roup St., Pittsburgh, Pa. 1892
Dr. JOHN C. SHRADER . . . . . Iowa City, Ia. 1890
Dr. EDWARD B. SHUTTLEWORTH, Professor of Bacteriology, Trinity Medical College . . 220 Shartowne St., Toronto, Ont. 1895

Dr. M. O. Silva . . . . . Morelia, Mex. 1892
Dr. E. T. Arthur Simard, Professor of Hygiene, Laval University . . . . . 10 du Parloir St., Montreal, P. Q. 1894
Dr. Horace Melville Simons, Manager of The Health Magazine Co. . . . . 72 Washington Loan and Trust Building, Washington, D. C. 1894
Dr. T. Grange Simons . . . . . Charleston, S. C. 1881
Dr. James Simpson . . . . . San Francisco, Cal. 1886
Charles E. Slocum, Ph.D. . . . . Defiance, Ohio. 1892
Dr. Freeman Evans Small . . . 776 Congress St., Portland, Me. 1894
Dr. Charles Smart, U. S. A. . . . . Washington, D. C. 1882
Dr. Baxter T. Smelzer, Secretary State Board of Health . . . . . 229 Hamilton St., Albany, N. Y. 1895
Dr. Andrew R. G. Smith, Member State Board of Health . . . . . Whitefield, Me. 1894
Dr. Charles D. Smith . . . . . Portland, Me. 1885
Prof. E. J. Smith, Professor of Chemistry, University of Wisconsin . . . . . Beloit, Wis. 1895
Dr. Frederick W. Smith . . . 700 S. West St., Syracuse, N. Y. 1896
Dr. Hugh M. Smith . . . . . 78 Orange St., Brooklyn, N. Y. 1889
Dr. J. Sol Smith . . . . . Denver, Col. 1895
Dr. Joel W. Smith . . . . . Charles City, Ia. 1888
Dr. Stephen Smith . . . . . 640 Madison Ave., New York City. 1872
T. Guilford Smith . . . . . Ellicott Sq., Buffalo, N. Y. 1896
Dr. William M. Smith . . . . . 91 First Pl., Brooklyn, N. Y. 1880
Dr. William T. Smith, Member Board of Health . . Hanover, N. H. 1896
Dr. S. Edwin Solly . . . 2 Cascade Ave., Colorado Springs, Col. 1895
George A. Soper, C. E. . . . . 220 Devonshire St., Boston, Mass. 1896
Dr. James D. Spencer . . . 59 Washington St., Watertown, N. Y. 1896
Dr. John R. Spier, Physician to Civic Hospital . . 2439 Notre Dame St., Montreal, P. Q. 1894
John Spirked, D. D. S. . . . . 287 W. 12th St., Chicago, Ill. 1892
Dr. Eli L. Standlee . . . . 2201 University Pl., St. Louis, Mo. 1895
Dr. Byron Stanton . . . . . Cincinnati, Ohio. 1889
Dr. Franklin Staples . . . . . Winona, Minn. 1885
Dr. Ralph E. Starkweather . . . . . Dearborn and Washington Sts., Chicago, Ill. 1879
Dr. Arnold Stedman, President State Board of Health, 722 14th St., Denver, Col. 1895
G. W. Stephens, Esq., M. P. P., 845 Dorchester St., Montreal, P. Q. 1894
Surgeon-General George M. Sternberg, U. S. A., Washington, D. C. 1874
Dr. James A. Steuart . . . . . 1611 John St., Baltimore, Md. 1874
Dr. Sarah Hackett Stevenson . . . . . Chicago, Ill. 1893
Dr. James Stewart, Professor of Medicine, McGill University . . . . . 285 Mountain St., Montreal, P. Q. 1894
Dr. Charles G. Stockton . . . . . Buffalo, N. Y. 1896
Dr. A. Walter Suiter . . . . . Herkimer, N. Y. 1894

Dr. JOHN C. SUNDBERG . . . . 1819 Clay St., San Francisco, Cal. 1892
Dr. QUINCY ORLIN SUTHERLAND, Member State Board of Health . . . . . 73 Milwaukee St., Janesville, Wis. 1895
Dr. H. C. SUTTON, Health Officer . . 220 N. James St., Rome, N. Y. 1896
Dr. GARDNER TABER SWARTS, Secretary State Board of Health, and Registrar of Vital Statistics . . . . Providence, R. I. 1894
Dr. R. M. SWEARINGEN . . . . . Austin, Tex. 1880
Miss ADA SWEET, Vice-President Municipal Order League 175 Dearborn St., Chicago, Ill. 1893
Dr. SAMUEL D. SWOPE . . . . . Deming, N. M. 1895
Miss MARION TALBOT, Assistant Professor Sanitary Science, University of Chicago . . University of Chicago, Chicago, Ill. 1893
Dr. ALEXANDER N. TALLEY . . . . . Columbia, S. C. 1890
ANDREW T. TAYLOR, F. R. I. B. U. . . . . 43 St. Francois Xavier St., Montreal, P. Q. 1894
Mr. THOMAS W. TAYLOR, Mayor of City of Winnipeg . 458 Bannontyne St., Winnipeg, Manitoba. 1894
WILLIAM C. TEICHMANN, Ph. D. . . 1141 Market St., St. Louis, Mo. 1896
Dr. H. S. TERRILL . . . . . Fort Riley, Kan. 1895
Dr. FRANCIS J. E. TETREAULT . . . . 110 Main St., Orange, N. J. 1894
Hon. JOSEPH ROSAIRE THIBAUDEAU . 857 Palace St., Montreal, P. Q. 1894
M. LOUISE THOMAS . . . . . 680 Lexington Ave., New York City. 1888
WOLFERSTAN THOMAS, President Montreal General Hospital . . . . . Sherbrooke St., Montreal, P. Q. 1894
Dr. J. G. THOMPSON . . . . . Angola, N. Y. 1896
Dr. PINCKNEY THOMPSON . . . . . Henderson, Ky. 1879
S. J. THOMPSON . . . . . Third Ave., Carbeny, Manitoba. 1896
Dr. G. B. THORNTON . . . . . Memphis, Tenn. 1879
Dr. A. D. R. THRANE . . . . . Eau Claire, Wis. 1889
Mr. E. T. TIFFT . . . . . Springfield, Mass. 1892
T. S. TIMPSON, C. E. A., L. S. & M. S. R. R. . . . Buffalo, N. Y. 1896
WILLIAM H. TOLMAN, Ph. D., General Agent N. Y. Asso. for Improving the Condition of the Poor . . . 105 East Twenty-second St., New York, N. Y. 1896
Dr. S. R. TOWNE, Assistant Health Commissioner . . . Omaha, Neb. 1895
Dr. ROBERT TRACY, Medical Health Officer . Hotel St., Belleville, Ont. 1894
Dr. ROGER S. TRACY . . . . 74 West Fortieth St., New York City. 1889
Dr. LORENZO TRAVER . . . . . 203 High St., Providence, R. I. 1892
C. S. TREAT . . . . . Buffalo, N. Y. 1896
Dr. WILLIAM S. TREMAINE . . . . Elmwood Ave., Buffalo, N. Y. 1896
Dr. H. G. TUCKER, ... 1270 N. Vine St., Nashville, Tenn. 1896
W. U. TUNISON, C. T. A., B., R. & P. R. R. . . . Buffalo, N. Y. 1896
Dr. THOMAS J. TURNER, U. S. N. . . . . Coldwater, Mich. 1877
Dr. C. F. ULRICH . . . . . Wheeling, W. Va. 1894
W. H. UNDERWOOD, G. E. P. A., M. C. R. R. . . Buffalo, N. Y. 1896
GEORGE URBAN, JR. . . . . Oak and Genesee Sts., Buffalo, N. Y. 1896
Dr. FERD C. VALENTINE . . . 242 West 43d St., New York, N. Y. 1896

Dr. J. H. Van Deman . . . . . Chattanooga, Tenn. 1873
Joseph Emile Vanier, l. C. . . 107 St. James St., Montreal, P. Q. 1894
Dr. E. V. Van Norman . . . . . San Diego, Cal. 1882
Dr. P. W. Van Peyma . William and Koettner Sts., Buffalo, N. Y. 1896
Dr. E. E. Vaughan . . . . . Cambridge, Mass. 1887
Dr. Victor C. Vaughan . . . . . Ann Arbor, Mich. 1883
Dr. Harry E. Vaux, Member Provincial Board of Health . . . . . Brockville, Ont. 1894
Major Albert Veeder, M. D., Health Officer, 12 Queen St. . . . . Lyons, N. Y. 1896
Dr. Andrew Truax Veeder . . . . . Rooms 310 and 311, Home Office Building, Pittsburgh, Pa. 1896
Mr. Joseph Venne . . . . . St. Jacques St., Montreal, P. Q. 1894
Dr. William A. Verge . . . . . 47 Grande Allee, Quebec, P. Q. 1894
Hon. J. O. Villeneuve, Mayor of Montreal, and Member Legislative Assembly, City Hall, N. W. St., Montreal, P. Q. 1894
Dr. W. W. Vinnedge . . . . . Lafayette, Ind. 1882
W. F. Von Beeskirk, C. E. . . . . Stratford, Ont. 1896
Dr. Karl Von Ruck . . . . . Asheville, N. C. 1890
Dr. F. L. Von Suessmilch . . . . . Delevan, Wis. 1880
Dr. Spencer S. Wade . . . . . Morgantown, W. Va. 1892
Dr. B. R. Wakeman, Health Officer . 73 Main St., Hornellsville, N. Y. 1896
Dr. Henry P. Walcott . . . . . Cambridge, Mass. 1880
Dr. Charles R. Walker . . . . . Concord, N. H. 1894
W. H. Walker . . . . Washington and Corroll Sts., Buffalo, N. Y. 1896
Norval W. Wall, C. E., County Surveyor, 319 Main St., Trinidad, Col. 1895
Dr. Ralph Walsh . . . . . Washington, D. C. 1885
Dr. John Wanless . . . . . 88 Union Ave., Montreal, P. Q. 1894
L. B. Ward, C. E. . . . . Jersey City, N. J. 1885
Col. George E. Waring, C. E. . . . . Newport, R. I. 1875
Dr. Irving A. Watson . . . . . Concord, N. H. 1881
Dr. J. Madison Watson . . . . . Elizabeth, N. J. 1882
Dr. William S. Watson . . . . . Fishkill-on-Hudson, N. Y. 1892
Dr. Alfred Tennyson Watt, Secretary Provincial Board of Health . . . . . Victoria, B. C. 1896
Dr. Warren Webster, U. S. A. . . . . Wells River, Vt. 1873
Dr. Milton C. Wedgwood, Member State Board of Health . . . . . 101 Pine St., Lewiston, Me. 1894
Hobart Weed . . . . . Buffalo, N. Y. 1896
Edson J. Weeks . . . . . Main and Erie Sts., Buffalo, N. Y. 1896
Henry P. Weidig, Ph. D., Chemist, . . Clifford St., Newark, N. J. 1895
Dr. Carl Weidner, Professor of Histology and Pathology, Kentucky School of Medicine . . . . . 1932 West Jefferson St., Louisville, Ky. 1895
Mr. Frank Wells, President State Board of Health, Lansing, Mich. 1893
Dr. Ernest Wende . . . . . 296 Water St., Buffalo, N. Y. 1894
Dr. H. P. Wenzel . . . . . Milwaukee, Wis. 1888

Dr. CHARLES P. WERTENBAKER, P. A. Surgeon,
U. S. M. H. S. . . . . Chicago, Ill. 1893
ROBERT SPURR WESTON . . . . . 21 Wyman St., Brockton, Mass. 1896
Dr. WILLIAM C. WEY . . . . . Elmira, N. Y. 1892
CHARLES B. WHEELER . . Erie Co. Bank Building, Buffalo, N. Y. 1896
ALFRED T. WHITE . . . . . 40 Remsen St., Brooklyn, N. Y. 1889
WILLIAM A. WHITE . . . . . 130 Water St., New York City. 1888
Dr. LINDSAY S. WHITESIDES . . . . . Franklin, Ind. 1894
Dr. WALTER S. WHITMORE . . . . 17 Broad St., Red Bank, N. J. 1896
Dr. WM. FREDERIC WIARD . . . . . Sacramento, Cal. 1894
Dr. J. W. WIELAND . . . . . 1993 Cowles Ave., Dubuque, Ia. 1894
Dr. CRESSY L. WILBUR, Chief of Division of Vital Statistics, Department of State . . . . . Lansing, Mich. 1894
Dr. ALBERT W. WILCOX . . . . . Laredo, Tex. 1892
Dr. WILLIAM LEROY WILCOX . . . . . Irving Park, Chicago, Ill. 1893
CHARLES M. WILKES, Civil Engineer, Asst. Engineer Water Supply, World's Exposition 1893
Dr. GEORGE WILKINS, Professor McGill University . . 898 Dorchester St., Montreal, P. Q. 1894
Dr. EDWARD S. WILLARD . . 17 Paddock Ave., Watertown, N. Y. 1896
Dr. ANNIE W. WILLIAMS . . . . . 1235 Vine St., Denver, Col. 1895
CHARLES H. WILLIAMS . . . Main and Eagle Sts., Buffalo, N. Y. 1896
GEORGE L. WILLIAMS . . . Erie Co. Bank Building, Buffalo, N. Y. 1896
RICHARD WELLINGTON WILLIAMS . . . . . Three Rivers, P. Q. 1894
CHARLES WILSON . . . . . Main and Tupper Sts., Buffalo, N. Y. 1896
CHARLES R. WILSON . . . . . White Building, Buffalo, N. Y. 1896
Dr. G. H. WILSON . . . . . 50 Colony St., Meriden, Conn. 1890
N. W. WILSON . . . . . News, Buffalo, N. Y. 1896
Dr. WILLIAM A. WILSON . . . 310 Paris Ave., Grand Rapids, Mich. 1896
Dr. A. E. WINCHELL . . . . . New Haven, Conn. 1886
Dr. URANUS OWEN BRACKETT WINGATE, 204 Biddle St., Milwaukee, Wis. 1890
Dr. SIMEON P. WISE . . . . . Millersburg, Ohio. 1886
Dr. G. F. WITTER . . . . . Grand Rapids, Mich. 1877
Mr. ALFRED VINCENT WOOD . . . 115 Amherst St., Brunswick, Ga. 1892
Prof. EDWARD S. WOOD . . . . . Boston, Mass. 1876
J. D. WOOD . . . . . 117 W. Eagle St., Buffalo, N. Y. 1896
Dr. JOHN ELIOT WOODBRIDGE . . 637 Prospect St., Cleveland, Ohio. 1896
Prof. S. H. WOODBRIDGE, Institute of Technology . . Boston, Mass. 1895
Dr. GALEN MURRAY WOODCOCK . . . 17 Adams St., Bangor, Me. 1896
Lieut.-Col. A. A. WOODHULL, M. D., U. S. A., . . . Denver, Col. 1874
C. R. WOODWARD, Mayor . . . . . Cairo, Ill. 1896
Dr. WILLIAM C. WOODWARD, Health Officer . . . Washington, D. C. 1896
Dr. NATHANIEL EUGENE WORDIN, 174 Fairfield Ave., Bridgeport, Conn. 1890
Dr. J. S. WORDLAN . . . . . Galt, Ont. 1896
Dr. HUBERT WORK, Member State Board of Health, 419 Santa Fe Ave., Pueblo, Col. 1895
Dr. A. R. WRIGHT . . . . . Delaware Ave., Buffalo, N. Y. 1896

Dr. FRANKLIN W. WRIGHT . . . 48 Pearl St., New Haven, Conn. 1889
Dr. JAMES HENRY WROTH . . . . . Albuquerque, N. M. 1896
Dr. C. C. WYCKOFF . . . . . 482 Delaware Ave., Buffalo, N. Y. 1896
Dr. RICHARD M. WYCKOFF, Deputy Com. Health,
532 Clinton Ave., Brooklyn, N. Y. 1894
Dr. WALTER WYMAN, Supervising Surgeon-General,
U. S. M. H. S. . . . . Washington, D. C. 1884
Dr. A. G. YOUNG . . . . . Augusta, Me. 1885

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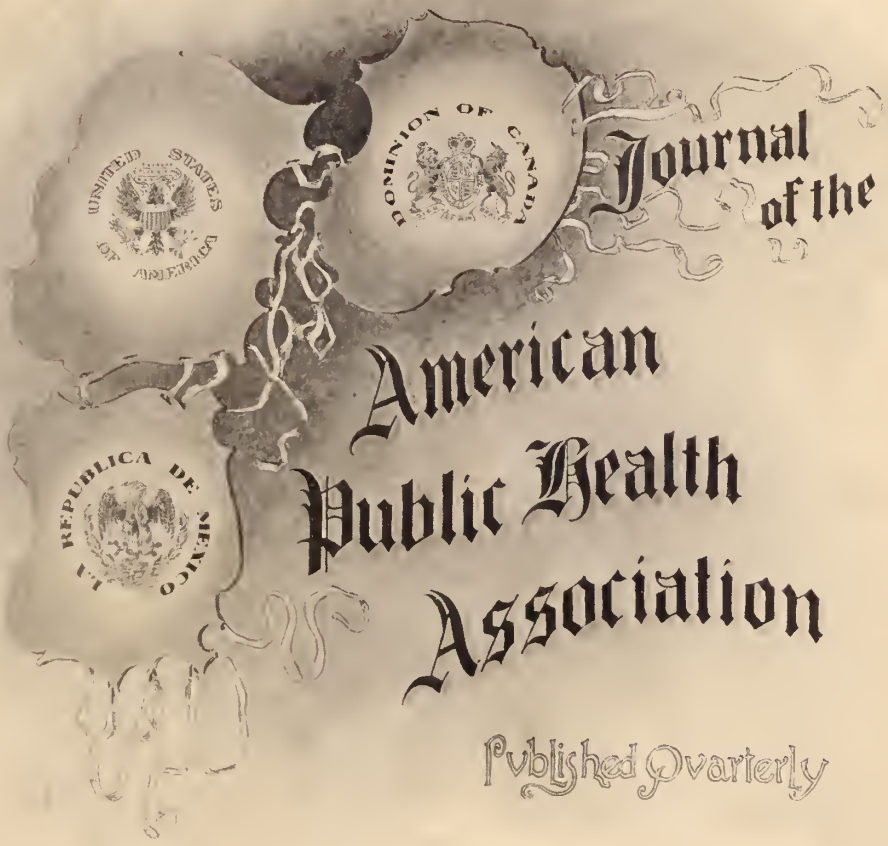

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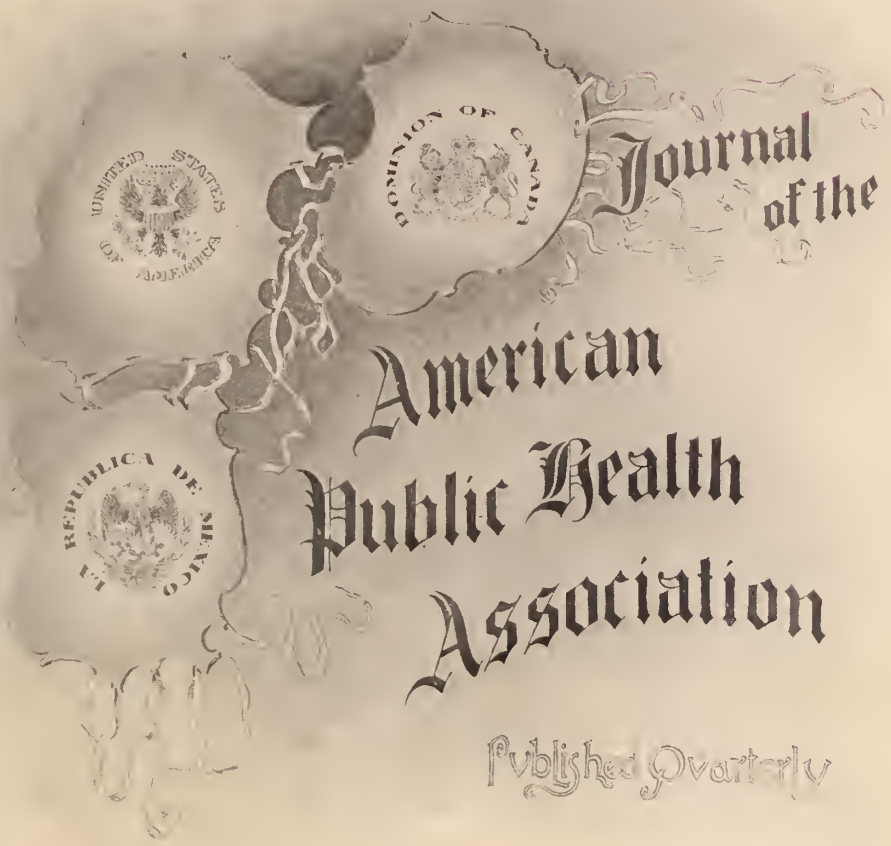

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HOUSEHOLD GARBAGE CARBONIZER,

For the Disposal of the Waste of Individual Households.

SANITARY CREMATING FURNACES.

This Company is prepared to construct **Cremating Furnaces** for the disposal of the waste from Hotels, Factories, Department Stores, Livery Stables, Hospitals, Public Institutions, Towns and Cities.

These Furnaces are adapted to the place where located, to the amount of waste to be destroyed of whatever kind or character, for the use of any available fuel, coal, gas, oil or wood, are strongly built, complete with every detail to make them convenient and accessible, simple in construction, and absolutely sanitary in operation.

THIS COMPANY ARE ALSO MANUFACTURERS OF

STEAM DISINFECTING APPARATUS.

Steam Disinfectors, double cylinders, rectangular or circular in form for disinfecting by Steam at High Pressure.

Steam Disinfectors, single cylinders, circular form especially adapted for Hospitals and Public Institutions.

Sterilizing Tanks for cleansing and sterilizing by boiling water, of all white goods.

Disinfection Tanks for Germicide and Chemical solutions.

Hot Air and Fumigation Chambers for preliminary cleansing of Clothing.

The Company has constructed several of the most successful plants in the United States.

Pamphlets containing full details of these various appliances will be sent upon application to

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